Franziska Ullmann

Basics

Architecture and Dynamics

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for my parents

Univ.Prof. Arch. Dipl.Ing. Franziska Ullmann
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Point and Point-Element

Line and Linear Element

Plane and Planar Element

Space and Spatial Element

The Poetics of Architecture

One of the most elegant principles governing aesthetics was advocated by the great architect Ludwig Mies van der Rohe in his statement, “beauty is the splendour of truth”. As conclusive and lucid as this seems – almost timeless – these words, which Mies borrowed from the theologian and Father of the Church Aurelius Augustinus, are as problematic, whether considered together or separately. For nothing has become as controversial over the years as the notion of “beauty”, nothing as elusive as an agreement about what is “true” and we are more likely to associate the word “splendour” with glossy material effects and superficial glamour than with the emergence or revelation of a harmoniously complete and transcendent reality.

In all the spiritually oriented ancient cultures, and particularly in Ancient Greece which Augustine himself held in rememberance, beauty in such earthly matters as music, sculpture and architecture was considered as a reflection of divine, heavenly order. The Copernican Revolution and the Enlightenment however dispelled this mythical-objective approach to - and justification for - all forms of art. Around 1600 William Shakespeare, through Hamlet, proclaimed that, “there is nothing either good or bad, but thinking makes it so”. And in the middle of the 18th century David Hume added that, “beauty is no quality in things themselves: it exists merely in the mind which contemplates them.” With this shift in the aesthetic and moral matrix from the cosmic to the subjective, the criteria of beauty became a matter of endless antagonism. That which had earlier been termed ugly, grotesque and alienating could now be seen – according to Edmund Burke – as “sublime” and be enjoyed with a shudder of relief. German Romanticism intensified this fascination with the “other side” of the coin of beauty, and while Classicism attempted some return to Aristotelian and Neo-Platonic ideals, the rest of the 19th century revolved around the frantic debate about “in which style should we build?” Karl Friedrich Schinkel – who combined the Romantic and the Classical in a single person – produced Neo-Romanesque and Neo-Gothic designs for the same church. Truth?

Only beginning in the so-called Classical Modern of the 20th century did a new concern for the rational, the clearly measurable and the socially useful emerge. Even the ideas of a Mondrian or Malewitsch, Kandinsky or Klee, Mies or Corbusier carry beneath their logically authoritative arguments and apparent denial of all historic, spiritual and natural mimesis the pulse of the transcendental or irrational. “Thinking” and the empirical approach were indeed now regarded as absolute, still they were not completely disengaged from the metaphysical. And so finally this intractable dilemma was reflected in the Post Modern — the cultural form rather than the style — as the liberating “Anything goes!?“ Grief over the futility of creating and

enforcing a “complete, universal law“ of beauty is sweetened by our delight at the unlimited variation of contemporary possibility in the unending spectrum of subjectively unearthed truths, qualities of life and architectural approaches. This true freedom does not automatically disembougue in arbitrariness, quite the opposite. One would need simply to substitute the simplistic, standardizing yardsticks, like the dogmas of the International Style, with a much more refined, open and both contextually fitted and elastic network of criteria, formal viewpoints, and poetics of content.

This book basically begins with this: as an encyclopaedia of design elements, effects and layers of meaning. It was originally developed for the curriculum of the Faculty of Architecture in Stuttgart but also more generally as a guide for everyone interested in quality architecture. Franziska Ullmann adopts as her compass the trio of terms used by Wassily Kandinsky – “Point and Line to Plane” – not so much as a means of justification and explanation of abstractions but rather as the key to a simple, logical beginner’s guide to make understandable an analysis of effects of spatial effects in the form of a geographically and chronologically comprehensive spectrum of architectural examples. It is an encyclopaedic reflection on the choreography of expression and sensation that are provoked and evoked through architectural acts. It shows us the kaleidoscope of architectural “languages” and their content which exists beyond the pure pragmatic facts of materials, construction, volumes and of styles in architecture. One could say that, what an encyclopedia of building expresses on the material LEVEL, this book offers us as basic knowledge in intangible SPACE dealing with the effects between people, society and the space-making art of architecture.

Seen thus, Franziska Ullmann’s “Basics” follows in the steps of important earlier works. I will name Christian Norberg-Schulz’s “Intentions in Architecture“ or Otto Friedrich Bollnow’s “Human Space“, both which were written in the early 1960s at the end of the era of the International Style. Further, Robert Venturi’s “Complexity and Contradiction in Architecture“, or the other relevant works by Rudolph Arnheim, Christopher Alexander and Joseph Rykwert from the 1970s. As with all of these texts, this book takes another run at formalising the effect built forms have — not only out of the academic, internal, architectural perspective, but also in all the rich variety that the anthropocentric functions of architecture offer and support.

Franziska Ullmann is Viennese and draws from the legendary formal potential of Modern architecture in Vienna while also from the locally cultivated skepticism of pure doctrine and absolute truth of any kind. Yet in Stuttgart she was also exposed to an important local tradition of architectural theory that owes much to the work of Jürgen Joedicke. In this context – and with recourse to the ritual references to architecture and beauty mentioned above – it is appropriate to remember two Viennese who made important contributions to the German language architectural-philosophical debate in post-war Central Europe: Ottokar Uhl and Herbert Muck, both of whom were acknowledged experts in modern sacred building who shared an analytical anthropocentric view of the design and effects of space. A highly simplified synthesis of their two points of view could be that, “the meaning of a form is determined by what it allows one to do in terms of it”, or, “the aesthetic of Modernism is derived from actions: the given form and formal effect of a space is a social plastic and is the activity patterns of individuals or groups which generate, structure and give meaning to such spaces and spatial sequences.” It is this perspective that Ullmann aligns with, and places above the abstract arguments of Kandinsky and Klee, and makes clear with examples from history and today. Clearly well-travelled, the author consistently explains buildings and situations from her own point of view – largely with the use of her own photographs.

An old saying states that “we can only see what we know”. In an increasingly image, word and symbol oriented information society, the understanding of constructed meaning also gets narrowed to the striking token and the formally conspicuous, purely visual excitement. Yet the medium of architecture both asks and commands many more non-verbal, preliterate, bodily, spatially dynamic effects. “The meaning of a form is determined by what it allows one to do in terms of it,“ – yes, and this nonetheless means something completely different from just transforming passers-by into customers or attracting stimulus-seeking architectural tourists …

This book is capably and passionately on the trail of this objective, this message. One hopes that as wide a readership as possible uses this book to develop the knowledge, framework and criteria to become effective in daily life and in the architectural discipline. And much more than this, to demand and strive for much more of those qualities which contemporary architecture in all its dimensions and aspects is able to provide.

Otto Kapfinger

Vienna, January 2010 (Translation: Michael Karassowitsch)

Born 1949. Lives in Vienna as an architectural scholar, journalist and curator, is author of numerous specialist books and exhibitions on twentieth-century and recent architecture in Austria.

“Space is defined by its boundaries”

I have always been fascinated by what exists around and in between, by what is subtly perceptible as opposed to what is directly visible. I am interested in which impact building forms have on the behavior of people in various social and cultural contexts. Also I like to watch the reaction of people and how their movements are influenced by the built surroundings. In short, our built environment formed through architectural elements evokes a communicative interaction which I like to examine.

The inherent phenomena of these (basic) elements seem to be globally understood. They have similar effects everywhere although they receive different meanings in different places.

The assumption, that space is defined by its boundaries implies that there are **basic architectonic elements** that define these boundaries and have a space-forming effect. Depending on their form and position, various forces and relations between the elements are produced. Their interaction characterizes and densifies specific areas, thus making them perceptible as designed space.
On a larger scale, these basic elements themselves – architectonic bodies and occupiable volumes – can form, inhabit, and displace space.

In this book my main intention is to sensitize the reader to **energies and dynamics** in a given spatial situation. Depending on the form of the elements, the inherent forces exist as **tensions** and **directions** and ultimately determine the dynamics of a space and its relation to its surroundings.

When trying to examine complex spatial relationships using simple, fundamental tools and to analyze their effects, one must inevitably neglect the influences of other elements and their special constellations to some extent. Thus here I can only touch upon the importance of some immaterial elements such as light.
There are many possible analytical approaches for breaking down the way we perceive space. I have chosen one that uses familiar ways for defining space and spatial forms.

Vertical and Horizontal Elements
This book examines physical space, which means that the architectural elements and volumes are material manifestations and subject to the laws of gravity. Here the understanding of the elements is based on their representation in the **plan**, which constitutes the interface of elements or objects with their horizontal base plan.

The plan shows the extent and form of the element, its body or matter in contact with the Earth. At the same time this base plane is also the plane of operation from the human user standpoint. In other words, we move beside, between, in, or around objects.

The basic vertical elements in architecture are **columns**, **piers**, and **walls**. As point-elements and linear elements they are represented in plan as points or lines. This also applies to point-element building structures like high-rises, or hollow linear volumes like tunnels or corridors. Basic horizontal elements are planar and extend two-dimensionally. **Floor** and **ceiling planes** are essential to space formation. In plan the form and extent are readily recognizable when viewed from above. Often it is not possible to gain such a clear "overview" in a real on-site situation.

Surface irregularities, gradients, and elevation differences are possible planar variations and can be recognized in the cross-section. (The chapter "Space" will examine the ceiling and its influence on space.)

Matter and Form
Point-elements like columns or piers can be non-directional or directional; they evoke a flow of movement around them or emphasize a certain direction.

Linear elements like walls or wall slabs are either straight or curvilinear and guide the user along their length. They are permeable or hermetically closed off and can subdivide or separate areas.

The planar element serves as an occupiable field, and again, its form influences or defines the various qualities of the area and is based on the fundamental dynamics of the given figure, e.g. as centered, directional, or amorphous. The power and dynamics of the elements addressed in this book shall be examined and organized by dimension based on Wassily Kandinsky's studies "Point and Line to Plane". As in painting, their effect – when translated to natural and built objects – is based not primarily on external appearance but on the "**tension inherent** in the forms". (Kandinsky)

Thus, a **point-element** signifies origin, center, intense concentration, and stillness of time. Addition, movement, or tension-filled relationships give rise to linear, planar, and spatial structures. **Linear elements** contain aspects of dynamics, direction, and the here and there. They imply the possibility of crossing over to the other side. Here the dimension of time also enters the equation.

Translated into physical action, point and line are primarily reflected in standing and walking while planar elements correspond to the lying state.

Planar elements define the form of a space; overhead elements determine the type of a space; vertical elements characterize the relations between spaces and between a space and its surroundings.

Mass as bound energy does not exist merely as a spatially occupied volume. Its impact extends past the actual object and into the surroundings. Here the relations between individual objects become especially important. Point-elements, for example, need space to unfold. The more mass they possess, the stronger this effect is. The force field of a mountain on an open plane is free to expand without encountering any obstacles. However, when elements or objects are positioned close together with overlapping force fields, the **densification of the space** in between becomes perceptible. This can occur on different scales. Spatial densification can be applied intentionally to form space from individual elements.

Structure
The analysis of each element follows the same scheme: first, the **element itself** is examined including its various forms of manifestation and effects. The second step contemplates the **element and its surroundings**. Next the **propagation of elements** is addressed. This usually marks the threshold to the next dimension. Finally, the chapter "Space" examines the characteristics of the **single elements from a spatial perspective**. The reader will find many examples for the interaction of elements that arise from basic dynamic forces such as centering, guiding, moving, flowing, or holding. In this book I only allude to the subjective perception of space. A more detailed treatment of this subject would go beyond the scope of this book. (Please refer to the bibliography for studies from various cultural and historical standpoints.)

Layout
The text and images are meant to be read together as a double-page spread in which both parts refer to the given phenomenon. The images conjure up associations, while the key words focus the reader's attention on specific aspects. The text explains these aspects further. The images have been selected to illustrate the phenomena, and whenever possible they are mentioned by name in the text or picture credits. In each case, there are many other possible interpretations and examples.

This book is intended to enhance the reader's experience and understanding of architecture, to help the reader look at architectonic elements and their forms with a more conscious eye. This awareness is capable of improving communication between the architect and the user. Understanding these elements informs us about the organizational intention and the philosophy and concepts underlying the planning and design of architecture.

Franziska Ullmann

Stuttgart–Vienna, July 2005 and January 2010

Point

The point indicates a position in space.
In mathematical terms, **it has neither length**, **width**, **nor depth** and therefore seems **directionless**.
It has a center and is thus **static**, **centered**, and **centralizing**.

The point and its properties as conceived of in the field of painting is my approach to architecture at the outset. This book will explore the spatial manifestations of the point-element. The imaging of an idea in painting starts with a point when the paintbrush touches the canvas. Similarly, in the built world the realization of an idea is marked by its transformation into spatial matter.

time- & dimensionless

Point 1| Place and Center. The Point-Element Itself

Point 1|1| Manifestations of Point-Elements

Since the point-element is the spatial manifestation of the one-dimensional point, it is an analogue of the point's visual characteristics. The qualities of being **static**, **centered**, and **centralizing** allow point-elements to be recognized regardless of their shape, outward appearance, or size.

No matter what the actual size of the object, a point-element at the moment of viewing, is an object fixed to a specific place. Based on its centeredness it marks a specific position in space.

This can be as solid as a rock …

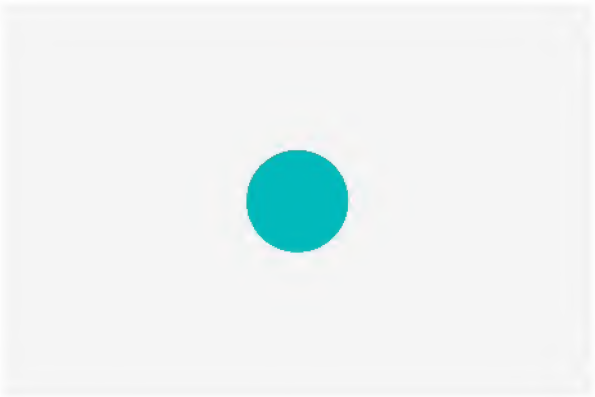
… or as transitory as a fountain of water …

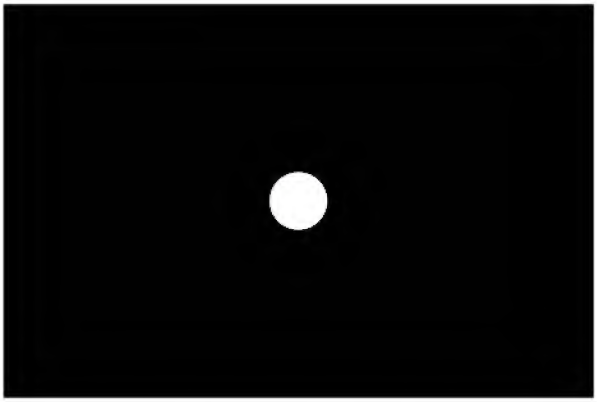
place

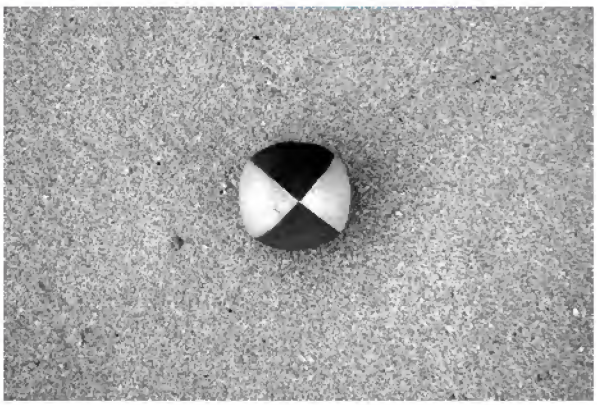
Natural
The point-element can be an elevated plane or a mountain in an otherwise flat landscape (Mount Ararat) …

Artificial
… or it can be a man-made elevation – stones stacked for a memorial (Arabian marabout to honor the village saint) …

center







It can be single trees in the landscape …

… or a group of trees that form an oasis in the desert (Tamerza, Tunisia) …

The point-element distinguishes and separates itself from its surroundings. We can walk around it, grasp, or embrace it. The point-element needs a distinctly different context to produce a strong effect. The more pronounced the distinguishing features are, the clearer recognition will be.

isolated

Points are centered elements. They have the potential for expansion but not for propagation.
Naturally occurring point-elements, such as topographical elevations, are often used for special purposes. They are centralizing due to their mass and striking form. An already defined position in space, an elevation protruding from the sea, was chosen to build the Mont Saint Michel monastery. The creators took advantage of the original quality of the special place for constructing a building complex on an already elevated ground plane. The Mont Saint Michel church steeple reaches heavenward, rising above and crowning the mountaintop while the mountain heightens the effect of the monastery.

centralizing

The central point is expressed by drawing contour lines that wrap around the peak of the mountain. Seen in plan, the contour lines describe a kind of mass or energy field that has formed around the apex or center.

According to these definitions, a human being can also be seen as a point-element, though the plan drawing alone does not suffice to describe the human figure. It is only in conjunction with the elevation that the form reveals itself in the vertical projection and is able to communicate more complex information.

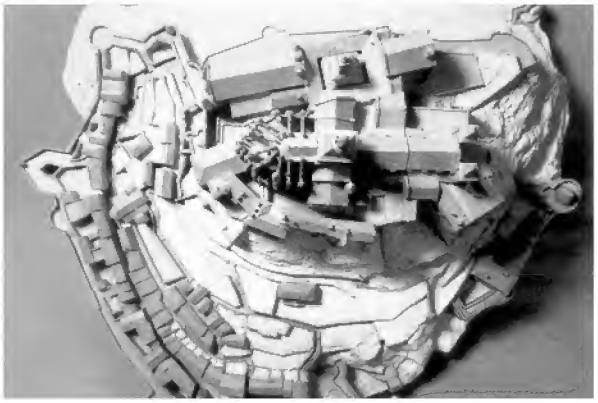
centered

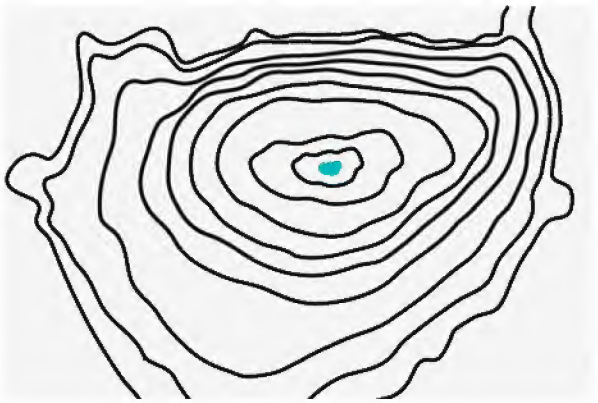
The laws of gravity – the pull toward the center of the Earth – and man's upright stance form the basis of our sensory perception, our sense of vision and balance. Humankind's ability to walk upright, its vertical development, is an achievement that involves overcoming gravity. This is an exceptional feat that is reflected in man's appreciation of vertical structures. Vertical point-elements whose proportions are similar to those of humans are recognized as being anthropomorphically related.

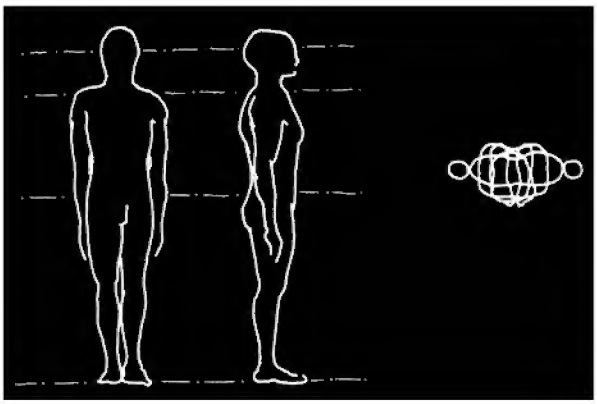
Darwinist view: allegory of man –
anthropomorphic recognition

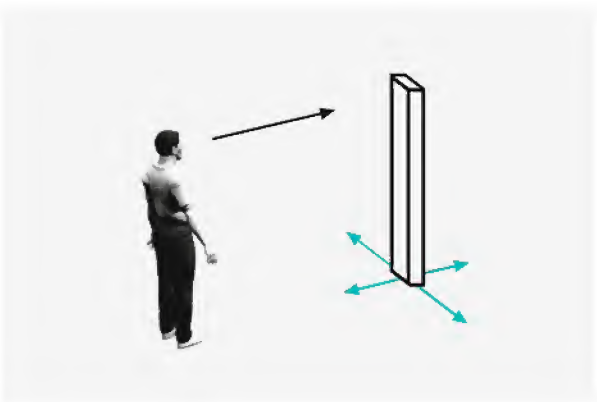
Mythological view:
reaching upwards, striving for the gods, yearning for a bond between heaven and earth

upright









As the previous examples demonstrate, the impact of a **point-element** is intensified through its extension in a vertical direction, through the emphasis of **the moment of rising**.
By contrast, if a point is **stretched horizontally** it produces a line, a **linear element**.
If a point-element is **extended homogeneously and horizontally**, it will become a **centered planar element** like the Piazza del Popolo in Rome.

vertical

Vertical point-elements take on special meaning depending on their height, scale, and proportion. Striving upwards can symbolize the connection between heaven and earth. The church steeple – here St. Stephen's Cathedral in Vienna – also represented the importance of the church as an institution; it was considered sacrilegious for secular buildings to surpass its height.

From a worldly point of view, every man-made towering object is a consciously administered act. Every building erected demonstrates what man is capable of and it becomes a symbol of power. The medieval towers of San Gimignano vied with each other in height and were vertical signs of the prominence of the aristocratic families.

meaning

Every artificially erected vertical object can be considered a sign. The actual meaning depends on the given context.
A point-element erected as a sign in our culture can be regarded as the basic form of the monument. Knowledge about the given cultural or religious context is a prerequisite for recognizing the monument as a sign to commemorate a place, person, or event.

This wheel standing upright on an open field near Harmannsdof in the hilly Weinviertel region of Lower Austria is an emblematic art object by Gerhard Kohlbauer. It resembles the circular face of the sun.
Lying flat it would lose its symbolic effect.

Jiři Seifert's square stele arrangement at the rock quarry in St. Margarethen in Burgenland addresses not only the theme of the point-element but its spatial energy field as well.

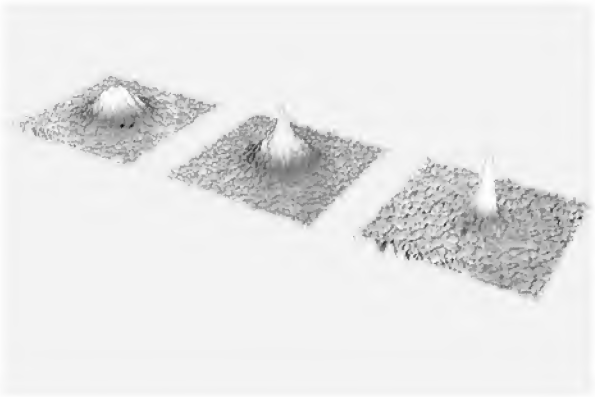
sign

The Architectonic Vertical. Column and Pillar

The column is an essential tool in architecture for representing a single point-element. It is a vertical element whose base plane represents an extended "point" (Victory Column, Berlin).

Whereas the appearance of a pillar might be considered the material expression of a load-bearing member, the column is an architectural allegory. Egyptian columns are formed to imitate the lotus and papyrus plants. Greek columns with their anthropomorphic divisions of base, bulging shaft, and capital provide the most important architectural reference to man and to the derivation of human proportions (Erechtheum).

column



Point 1|2| Origin and Void. The Point as Idea

Definitions:
punctum [lat.]: that which is punctured
To Euclid a point is something that has **no parts**, something singular and non-divisible. To him, the point is both zero point and the beginning point of materialization. Leibniz differentiates between the *metaphysical point* (primordial unity) and the *mathematical point,* a point with a **precise location**.
Arnheim: *A point is the place where everything converges.*

The zero point means **beginning** and **origin** in the Euclidian geometric coordinate system.
In "The Nature of Nature", Klee refers to the point as the center of a cosmic world view, as the **primal cell**, the source, the beginning of creation, and the center of gravity. Furthermore, the point is also a **period**, which is final and puts an end to things.

origin

Kandinsky defines the point as something **solitary**, **singular**, **individual**; as the **starting** and **end points** of a line; as the **point of intersection** between lines; as the **corner point** where lines meet at the junction of planes and spaces, or at the intersection of three planes.

In *sculpture and architecture, the point results from a cross-section of several planes …* [PLP 40] – thus it forms the terminal point of a solid angle as well as the point at which these planes originate. The corner point of a volume marks the transition to existing “infinite” space; it “touches the sky”. The upturned corner point in Chinese buildings comes from the Asian school of **Feng Shui**. This form is believed to create a vortex of the building’s energy, which delays its dissipation.

corner point

The Imaginary Point

The **void** or leaving the center unoccupied:
Even a void can mark a place. The figure of a circle or a centered or concave form suggests a center that need not be defined. In the same way, one perceives the focus of an object even if it is not indicated. In Asian architectural language, the void is a conscious design principle; in the European context, the center is usually occupied.

In the Pantheon in Rome, the circular opening at the crown of the dome intensifies the central void and suggests an imaginary vertical axis through the oculus, the center of the sphere, and the center of the circle.

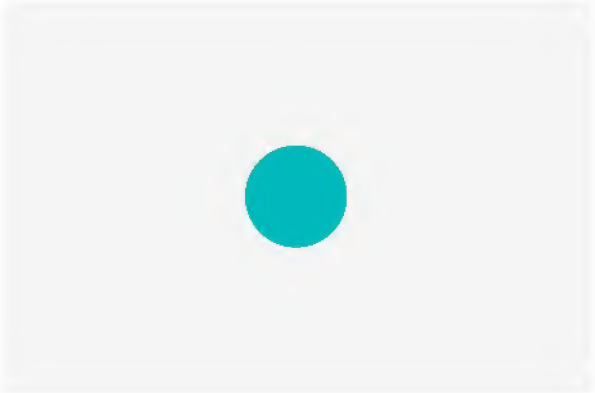
point of intersection

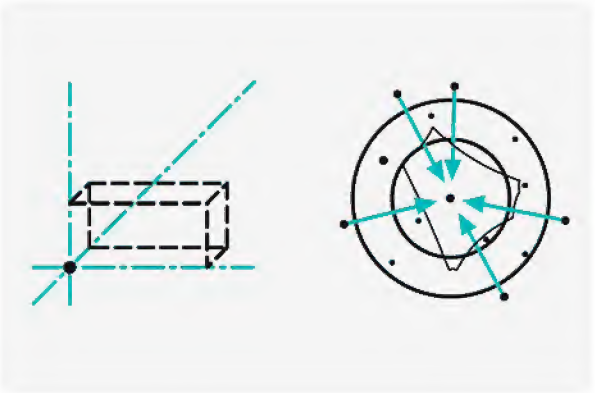
The Imaginary Vertical

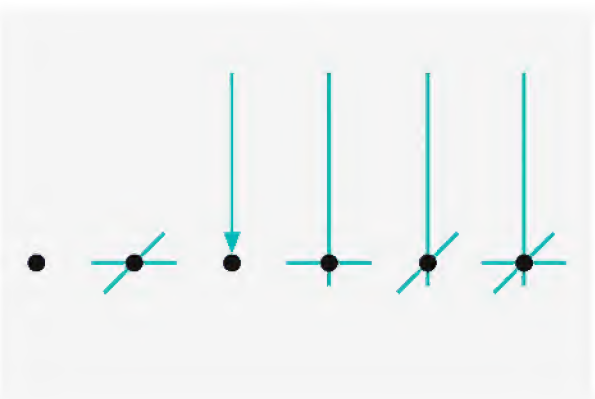
Physically speaking, an imaginary point is the point where matter meets the earth’s surface as a result of gravitational forces (the point of impact of an imaginary object’s fall line). Due to its orientation on our planet’s center of gravity the imaginary vertical (fall line) assumes a special role: it constitutes the absolute vertical at any given point. To Rudolf Arnheim it embodies standstill and equilibrium, the relationship between the points on its vertical axis is **hierarchical**.

An imaginary point can also be the point of intersection of an imaginary vertical and an imaginary horizontal, as is the case with ecclesiastical architecture. This is the point, in mythological terms, of contact between the earth and the axis mundi, the world axis, a place of transcendence – the point where the earthly rises to meet the heavenly.

axis mundi







The Inner Meaning of the Point

When attempting to describe a point or a point-element, we are not dealing with a purely factual or geometrical distinction. In his study "Point and Line to Plane" [subsequently referred to as PLP] Kandinsky attempts to differentiate between the **external and internal concept**: *In fact, it is not external form that materializes to express the content of a painting but, rather, the forces = tensions alive within it. […] The content of a work of art finds its expression in its composition: that is, in the sum of the essential inwardly organized tensions. This seemingly simple statement is of considerable fundamental significance, for it separates not only present-day artists but all living people into two groups depending on whether or not one agrees or disagrees: 1. those persons who recognize not only material things but also the existence of the immaterial or spiritual, and 2. those who choose to accept nothing beyond material evidence.* [PLP 33]

external – internal

If, therefore, we assume that in addition to its material expansion a point-element creates a field of energy or tension that extends past its physical bounds, then it must be immersed in this field of energy. Like the ripples produced on the surface of a body of water when a stone is thrown into it, a circular point-element is also surrounded by circular waves radiating outward. These waves of energy emanate from the center in all directions; seen from the outside, all vectors are directed toward the center. (Place de la Concorde, Paris)
Moreover, Kandinsky believes that every manifestation can be experienced or derived from the nature of the manifestation in two ways. The conception of element can thus be understood as both external and internal. On the outside, every single drawn and mathematical form is an element.
On the inside, it is not the form itself that is the element but the inner tension alive within it.

inner tension

Geometric and painterly standpoints converge. This can be seen in Kandinsky's examples of point-elements, which may, according to him, have different forms with different impacts.

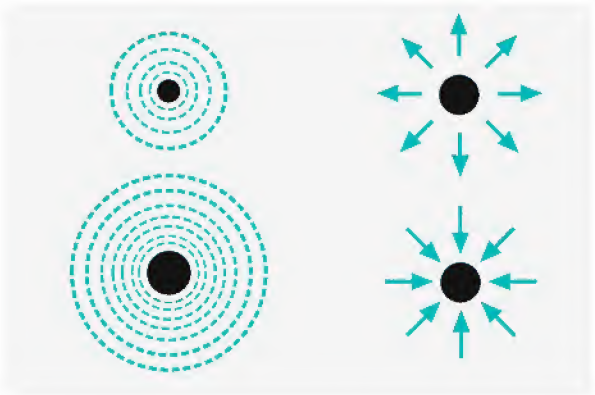
This explains how it is possible to recognize the basic message of completely different architectural point-elements and point-element volumes, even ones of varying scale such as a tombstone in Radjastan or the Memorial to the Battle of the Nations in Leipzig.

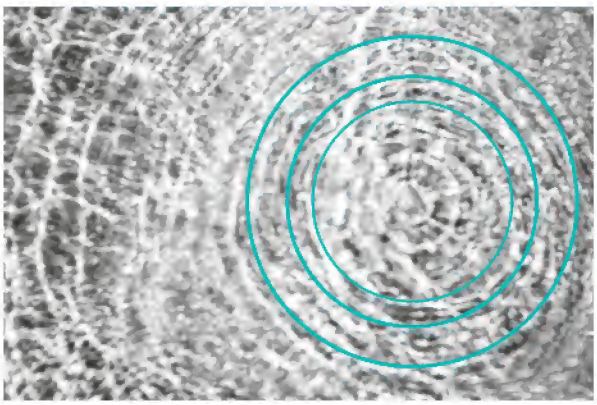
dimensionless

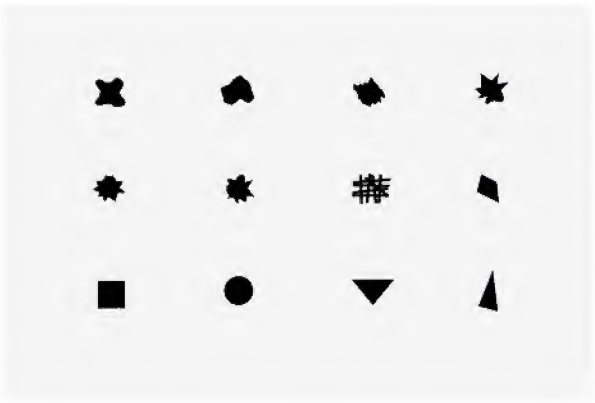
A solitaire, in its original meaning, is a gem set alone. In German, the term Solitär is commonly used in an architectural sense to refer to objects that stand alone like isolated or solitary landmarks. Their symbolic nature is accentuated by the emphasis of their verticality. If we imagine these points as miniature buildings – as individual gemstones – it is easy to understand what Kandinsky meant by inner tension. Inherent in the form is the inner meaning of the point-element, but the formal expression (Gestalt) can provide much more additional information.

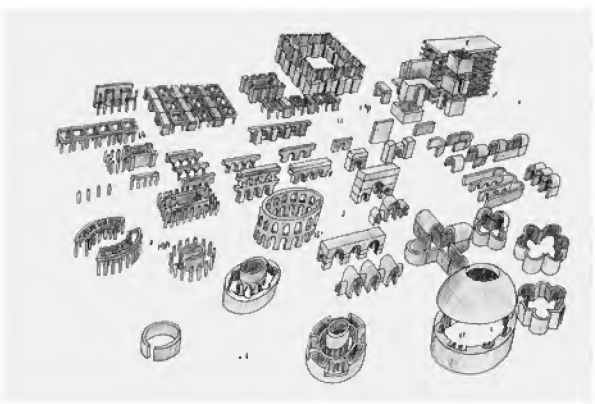
In the urban panorama of Rome (here as a drawing by Thomas Gronegger) individual buildings such as the Colosseum and the Pantheon stand out as centered point-element volumes.
In this model of the city, the Circus Maximus also stands out by virtue of its size, though as a linear rather than centered form.

Solitär









Point 1|3| Non-Directional and Directional

In plan, point-elements can be divided into two basic forms: non-directional and directional elements. The outer boundary determines the outer **form** and its **dynamics**.

Point 1|3|1| Non-Directional Point-Elements

Directionless or non-directional elements with a non-irregular plan form radiate evenly in all directions. Their outward emanations can be represented by concentric rings.

The most important non-directional element in architecture is the circular column. It specifies no direction and the surrounding space flows around it evenly. The same applies for point-element volumes, which can be represented in the plan view as circles. Both appear centered and hold infinite possibilities for arrival and departure.

column

A circular object acts autarkic and must be freestanding.

With all vertical elements one must ask how high the element is, how it sits on the ground, what the middle section looks like, and how it ends at the top. Should the column simply be cut off at its upper end, or does a widening into a capital imply that it supports a heavy load?

In this way the articulation of the top and bottom ends determines how the building stands or rises. An emphasis of the horizontal strengthens the building's connection to the ground, whereas an emphasis of the vertical expresses an active relationship to the sky and to light.

supporting

In his book "Intentions in Architecture" Christian Norberg-Schulz defines **standing as a relationship to earth** and **rising as a relationship to the sky**.

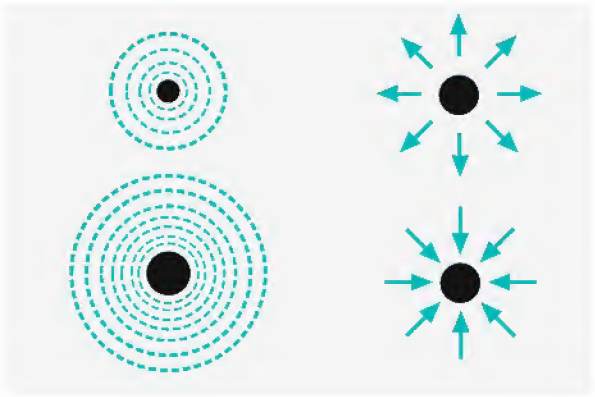
Entasis: reference to the human figure is emphasized most strongly in the Doric column. The center of gravity is especially pronounced in the convexity of the shaft. A marked bulge in the shaft intensifies the forces parallel to earth (horizontal) and might be used in temples dedicated to a female deity, e.g. the Temple of Hera in Agrigento. (By contrast, the columns in the Temple of Apollo in Delphi exhibit no entasis, and the vertical axis isn't slowed). In this way the Doric column embodies both standing and rising at the same time, and the sharp edges of the fluting make it seem to project into the surrounding space more strongly than does the Ionic column with its truncated fillets between the flutes – as in the Temple of Saturn at the Roman Forum – or a column that is entirely smooth.

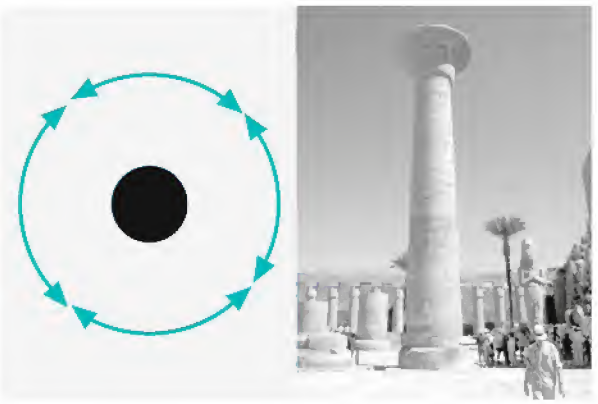
standing

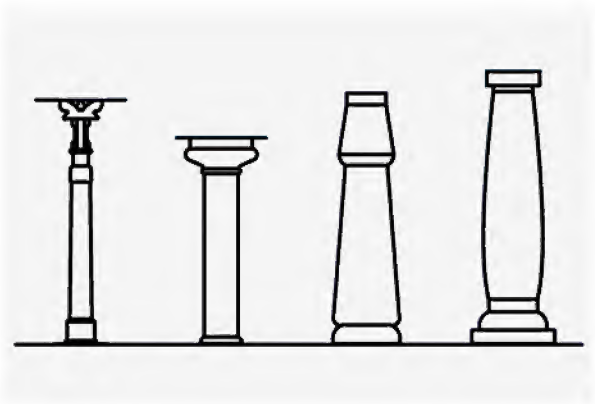
Whereas a column that ends with a horizontal plane emphasizes the real height, the tapered spires of minarets point to the heavens, and through their upward dynamics they seem to project themselves beyond their actual termination point.

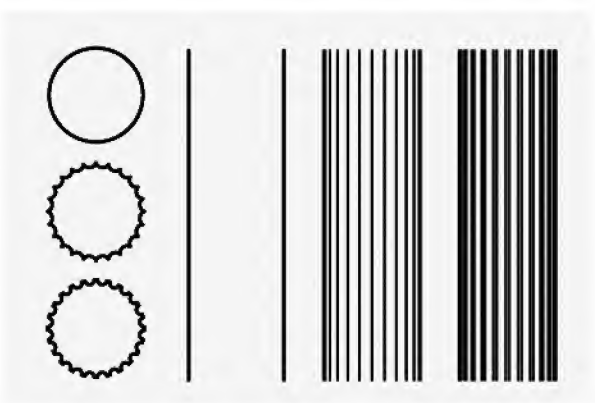
Their arrangement marks the corners of the courtyard, and they stand as clear signs in relation to each other. [See chap. Line 1|2|1| The Phenomenon of Connection] From spire to spire they seem to span an imaginary space over the Blue Mosque in Istanbul.

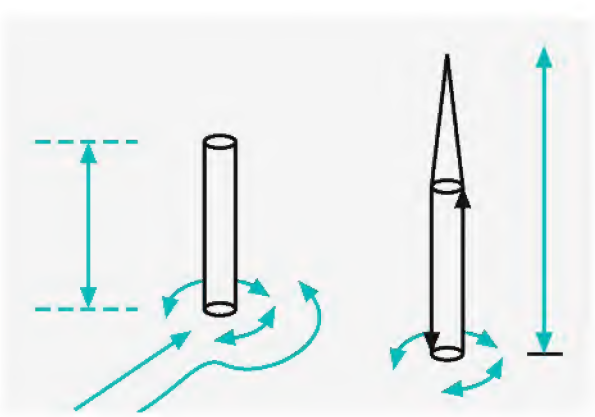
rising











Examples for non-directional elements are the circle and all figures with centered, non-irregular base planes. A circle extended vertically into space can produce a **column**, **cylinder**, **dome**, and **cone as non-directional point-elements**.

Depending on their size and significance these point-elements require a certain amount of space. Here, once again, the base and overhead planes reflect the intended meaning of the object.
An overhead plane parallel to the ground binds the building to earthly tasks (Wind Tower in Yokohama by Toyo Ito). The skyscraper proposal by Adolf Loos shows no tendency to reach for the sky and demonstrates its resolute attachment to the earth with its pedestal-like, cubic base structure and a pronounced horizontal overhead plane.

cylinder

Despite the spiraling exterior stairway, the upward trend of the cylindrical train station tower is arrested by a marked horizontal overhead plane, which clearly defines its actual height.
The tiers of the conical roof above the cylindrical body emphasize the hierarchal significance of the vertical axis in the Temple of Heaven in Beijing. A curving silhouette enhances this effect all the more by lending momentum to the vertical forces as they rise upward.

This is an observation tower by Jörg Schlaich which is an especially dynamic vertical spiral that winds heavenwards from Killesberg Park in Stuttgart. The system of cables that serves to stabilize the steel construction seems to tie the delicate structure to the earth and prevent it from taking off and spiraling upward.

cone

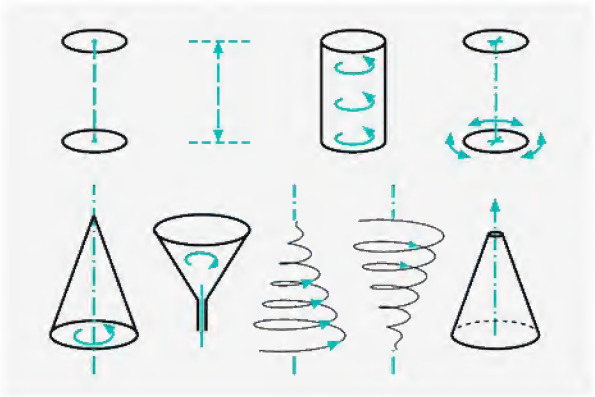
Similar in appearance is Peter Ebner's plan for an observation tower on the Kapuzinerberg in Salzburg. The load-bearing and twisted center slab encourages the upward motion and the climb up the tower.

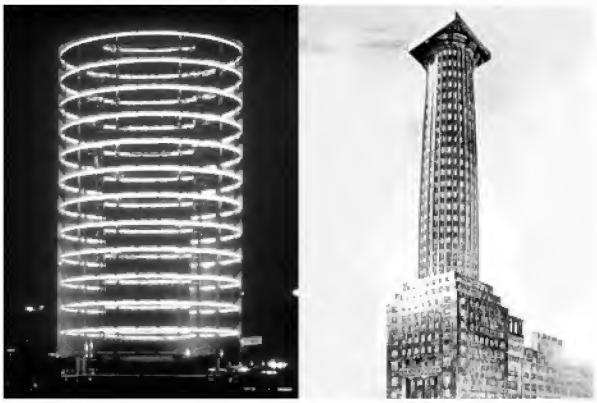
In this case the height is clearly defined by the flat upper landing – it corresponds to the height of the mountain and the observation deck and makes no pretense of appearing taller than the maximum height required by the object.

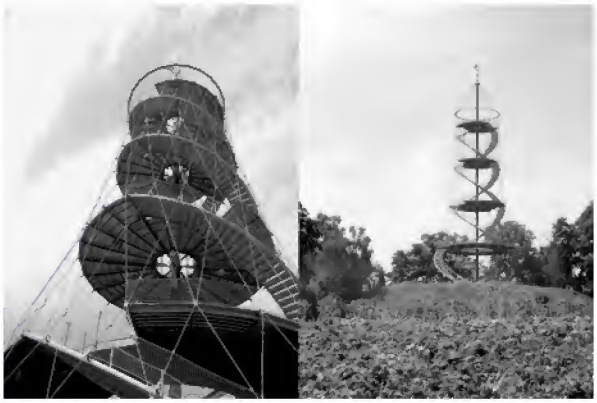
In general, we may assume that **centered objects** can always be considered extraordinary structures. Because of the **special characteristics** of the circle, objects, or structures with a circular base offer no connectivity and must be free-standing to achieve their full effect. [See chap. Plane 2|1| Visual Perception of Planar Elements]

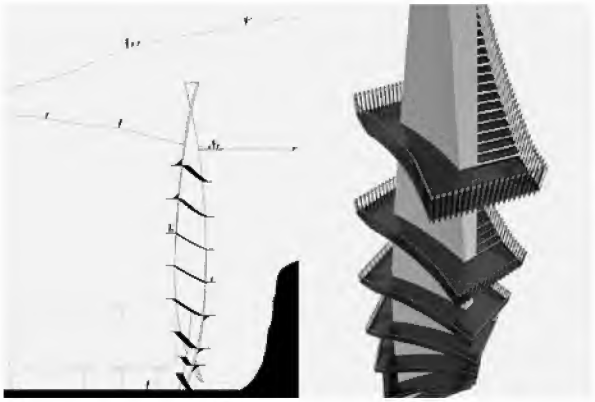
Through its horizontal overhead plane the Castel Sant'Angelo in Rome makes reference to its secular origin as a mausoleum for Emperor Hadrian. In its present form it reflects one of its previous functions as a papal refuge. By contrast, emphasizing the vertical direction will strive for a transcendental meaning, as implied by the towering dome and lantern of St. Peter's Basilica.

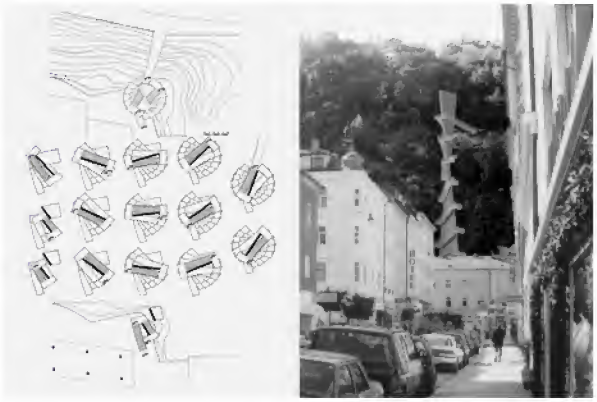
dome











Rounded, polygonal, or amorphous forms and shapes with so many sides or corners that they can no longer be perceived individually, e.g. stars, imply no preferred direction. Buildings that aren't based on right angles but whose angles are obtuse, will be recognized as centered if all their sides are nearly equal. Five corners are enough for a form to be perceived by the viewer as non-directional. Only a four-sided equilateral polygon – a square – produces a form that borders on both directional and non-directional.

This Russian church in Leipzig demonstrates ambivalence between the outward appearance of a four-sided enclosure and a many-sided interior space. The square base anchors the structure to the ground and the terrestrial realm, while the building's vertical orientation and the near dome-like ceiling underscore a transcendence of the worldly.

polygon

An interesting example of a polygon is the octagonal plan upon which a number of medieval buildings were modeled. The Castel del Monte crowns a hill in Apulia. It was built by Emperor Frederick II, who in his day was certainly familiar with the widespread symbolism of the octagon: the circle stood for infinity, the heavens, and therefore symbolized the divine. The square, by contrast, with its four corners and perfect equilaterality represented the earth, the temporal, this world. Thus, the geometric form of the octagon was the ideal link between the circle and the square, an intermediary between this world and the next. Studies by Tavolaro have revealed that in addition to the intended geometric form, the linear and angular measurements of the castle's site, perimeter, axis, and proportions were taken according to precise astronomical considerations. Thus it also represents an enormous calendar of the heavens.

octagon

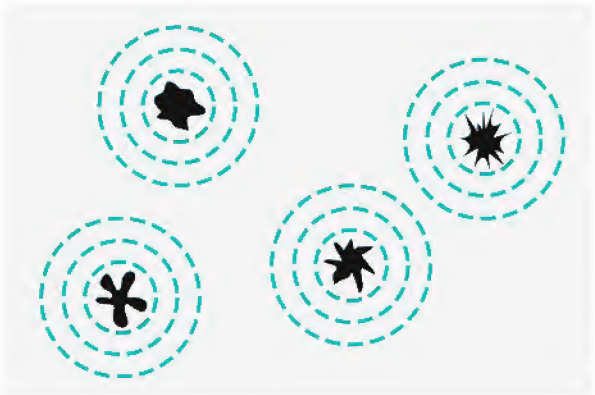
Amorphous structures also tend to show no directional preference, so that it is hard for the viewer to discern a specific orientation. An emphasis can, however, be seen in the plan view which usually reveals a course through the center that implies a direction such as in the plan for the Centre for Photonics and Optical Technologies in Berlin by Sauerbruch/Hutton or in this vase by Alvar Aalto.

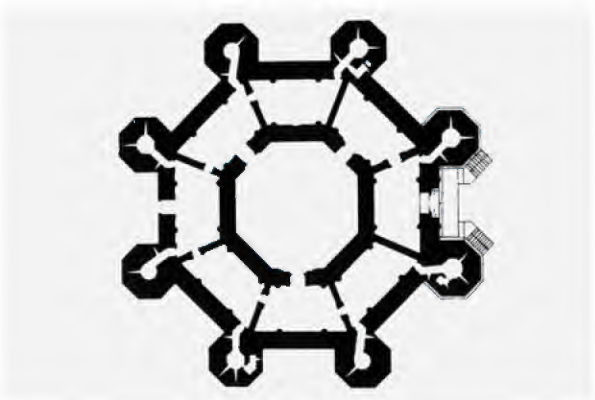
amorphous

The New Philharmonic Hall in Berlin designed by Hans Scharoun with its many roof peaks points in various directions. Despite its dynamics and inhomogeneous overall form, this irregular building is regarded as a coherent and centered point-element.

Another example of a solitary building that avoids assuming a direction is a stack of angular blocks like Frank Gehry's office building in Düsseldorf's Media Harbor.

dispersed





Point 1|3|2| Slightly Directional Point-Elements

As opposed to round point-elements like columns, which display no directional preference, point-elements with a rectangular cross section emphasize directional movement along two perpendicular axes. **Obelisk, pillar, and pier constitute directional point-elements.**

Intersection and Orientation

The shapes of the point-elements chosen provide information about their tasks in relation to their surroundings or to the buildings themselves. They influence the dynamics of the movements arising around them. While round shapes encourage circulation, those with rectangular, square, or cross-shaped sections select and emphasize two directions, as in the garage of the Johnson Wax Headquarters by Frank Lloyd Wright.

pillar

Special Form – The Square

Square point-elements emphasize two equally dominant directions and mark the **point of vertical and horizontal intersection**.

Square point-elements in the form of obelisks are directional and centered. They are usually orientated to face the four cardinal directions. Their autonomous character and far reaching axial effects predestines them to serve as monuments. The square obelisk on the Piazza del Popolo describes a primary axis of the city that runs along the Via del Corso, while the perpendicular axis marks the spot where one enters the city.
In 1816, Giuseppe Valadier introduced an additional “green” axis on the perpendicular which runs between Pincio Hill and the Tiber – an addition that today leads to ambiguity about the urban plan.

cross

Square supports emphasize solidity and immovability. Centered objects that use the square as their base plane, like the **pyramids**, belong to the architectural **archetypes** and carry special significance.

The Beinecke Rare Book & Manuscript Library at Yale University, which was designed by the architecture firm SOM under Gordon Bunshaft, rests on four square pyramid-like supports positioned at each of its corners. Their self-contained form gives them the character of objects that hold up the shrine and only touch it minimally so that it appears to float.

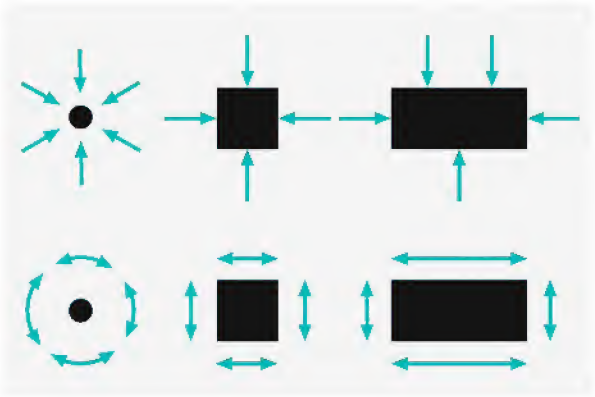
The Egyptian pyramids demonstrate that if the vertical axis is emphasized, the static centeredness of the primary form merges with the upward reaching dynamics. The earthly is drawn into a relationship with the heavenly. The object becomes the symbol of death and the yearning for immortality.

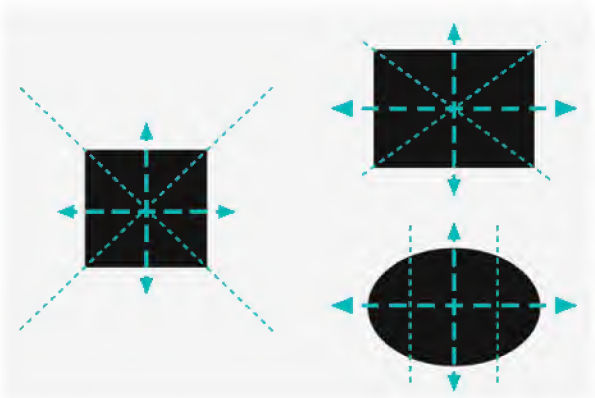
square

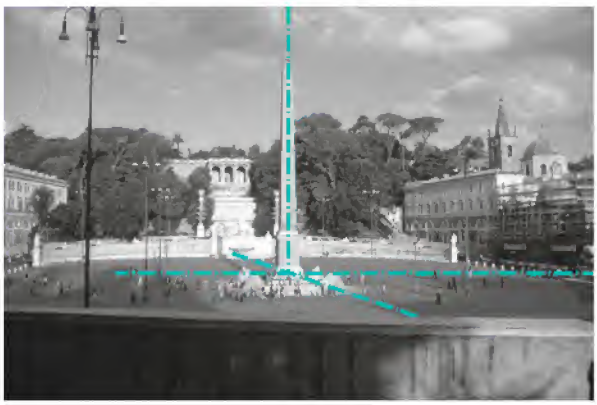
Point 1|3|3| Directional Point-Elements

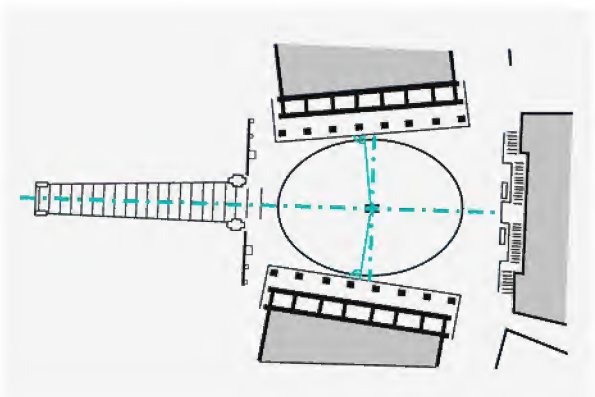
Examples of directional point-elements are the **rectangle and the ellipse**. These primary geometric shapes are immediately recognizable because of their strongly centered and also directional form. At the center of the Piazza del Campidoglio in Rome the equestrian statue and its rectangular pedestal that face the visitor approaching from the stairway mark the main axis. This monument interrupts the central axis of symmetry of the ramped stairway, and one might say that the dynamics of approach to the Piazza is propagated across the square in ripples that emanate from the statue.
The central axes of the flanking buildings also converge toward the statue. If one enters the square from the Forum side, one might interpret the paving design as a kind of rippling energy field around the equestrian statue, reflecting off the obliquely angled walls and being warped. The trapezoidally skewed ground plane of the square finds its balance in the elliptical paving design.

rectangle









Tomáš Masaryk commissioned the Slovenian architect Josef Plečnik, who was one of Otto Wagner's students, to redesign the Castle District in Prague, converting it into a national monument (1920). As part of the architectural scheme, a statue and a fountain were positioned in the third courtyard of the castle on Hradčany Hill using directional and non-directional elements to enhance selected points of reference (as researched by Tomas Valena).

orientation

The main axes of the rectangular pedestal allow it to follow important sight lines and to thus reference existing relationships. The pool of water at the base takes on the direction of the axes, but by virtue of its square plan it is much more centering than the rectangular pedestal. The neutralizing containment of the pedestal and pool by a circular ring strengthens the planar cohesiveness. The object appears to be both autonomous and anchored.

points of reference

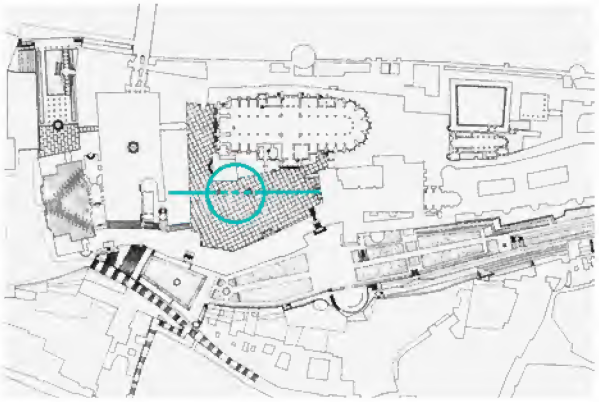
Compact volumes as planning elements have a similar dynamic effect on their surroundings as centered or slightly directional point-element volumes. The elliptical or rounded plan of the river watchtower in Guilin, China, follows the direction of the current of the languidly flowing river.

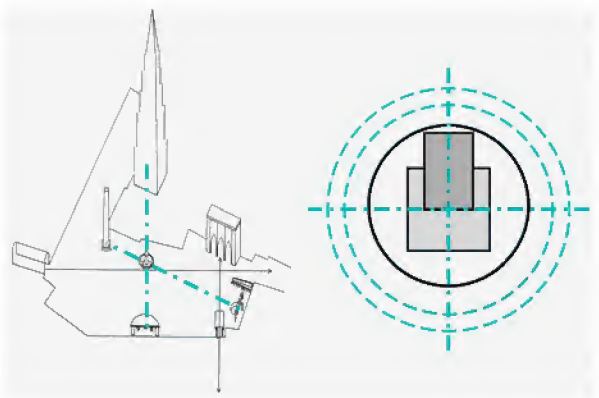
The rectangular plan of a station building with its pronounced corners underscores the action of stopping. If the body of the building were set perpendicular to the tracks it would express a clear "stop", like a border station. The parallel arrangement emphasizes an accompaniment of the train rather than a stopping.

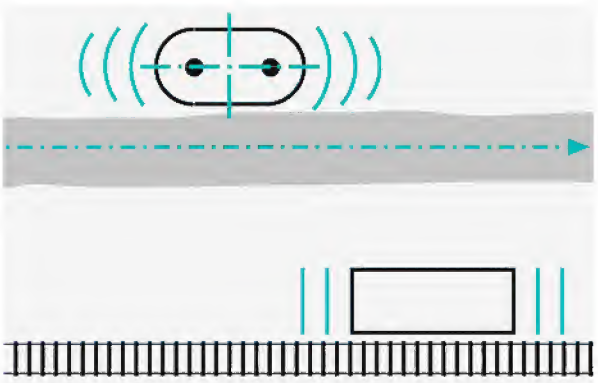
point-element volume

The Dance Theatre in Singapore is dominated by its oval structure. It was built based on plans by Michael Wilford and a façade design by Neil Thomas. It is elevated on a platform and slightly directional in plan. V-shaped pilotis raise the building off the ground. Pulling in the curved wall below the middle line suggests a fruit-like overall shape. Its rounded form seeks to maintain tension and concentration in the interior of the building. Its puffed-up appearance suggests a theater filled to bursting and supports its object-like and autonomous appearance as a Solitär.

Casa Poli is set atop a jagged cliff in coastal Chile by Maurizio Pezo and Sofia von Ellrichshausen. It is a great concrete cube evoking a block of porous stone which functions both as a summer house and a cultural center. To serve in this contradictory way, the main rooms must resolve a very public aspect and a very intimate and informal one. They are left nameless and functionless. Service spaces are all organized inside a deep perimeter zone – a thick wall – including vertical circulation and a number of balconies.







Point 2| Balance Point and Center. The Point-Element and its Surroundings

A point-element in the form of a circle has a uniform effect on its surroundings in all directions.
In a relatively small point-element the internal circular force does not affect the surrounding "walls". If the circular point-element is larger, however, the energy field "touches" the bordering areas. This section will examine the point-element embedded in its surroundings.

Point 2|1| Balance Point

Geometrically, the center point lies at an equal distance from the outer points of a regular figure. Physically, the sensation of the center also marks the balance point. Visually, we instantly recognize the center point based on these empirical bodily experiences.

expansion

Point 2|1|1| Single-Sound

If we consider, along with Kandinsky, the most simple and concise case, that of the centrally-placed point [PLP 36], we must differentiate between the following possibilities: a| the inner absolute sound of the point, and b| the sound of the given location in the basic plane. If the center of the plane is the center of the point, if **both balance points coincide**, a quantitative definition becomes clear, determinable, and calculable. *The double sound – point, plane – takes on the character of a* single sound *[…].* [PLF 36]
A similar effect is produced in buildings when several centered planes overlap and if the centers coincide. Concentric circles constitute the basic form of a church designed by Jae Cha and built by the congregation in Urubo, Bolivia. The distinct middle is a structural and a spiritual center that is intended to strengthen a sense of community. The two circles form a uniform annulus as a perimeter filter zone between the church and its secular surroundings.

single-sound

Point 2|1|2| Double-Sound

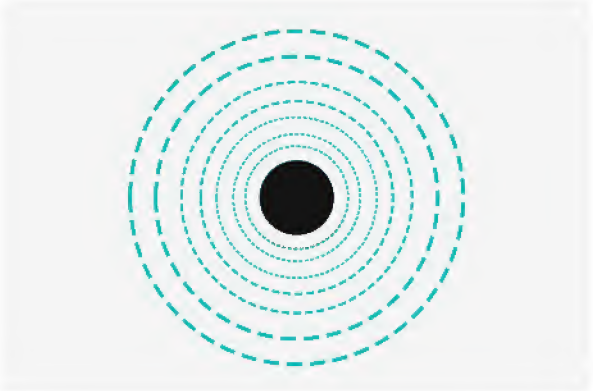
According to Kandinsky, at least a double-sound is necessary to create complexity – i.e. **different centers**. *At the moment the point is moved from the center of the basic plane – eccentric structure – the double sound becomes audible* [PLP 37] and transforms the absolute sound of the point into a relative one. The double-sound is a means of achieving primitive rhythm, shifting slightly off-center, upward and to the right, immediately discernible to the eye. The right edge draws the point toward it leading to a loss of autonomy.

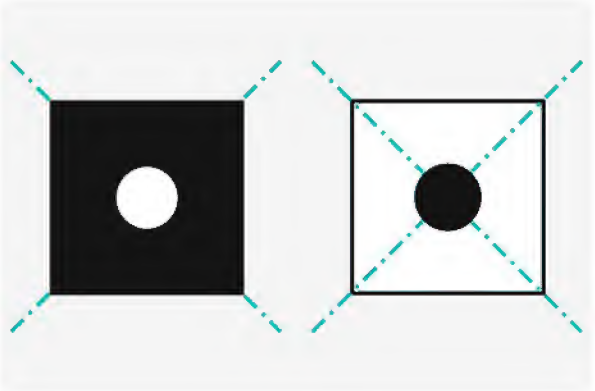
The function of a point-element (e.g. column) depends on its position in space. In the center, the key position, the column's field of energy can expand fully (single-sound). Since one must circulate around it, space is reduced to nothing but a surrounding field. Shifting the column from the center generates various relationships between it and the surrounding space. Depending on their positions, the column and the space remain discrete entities (double-sound) or the column's radius of effect becomes constricted or even disrupted.

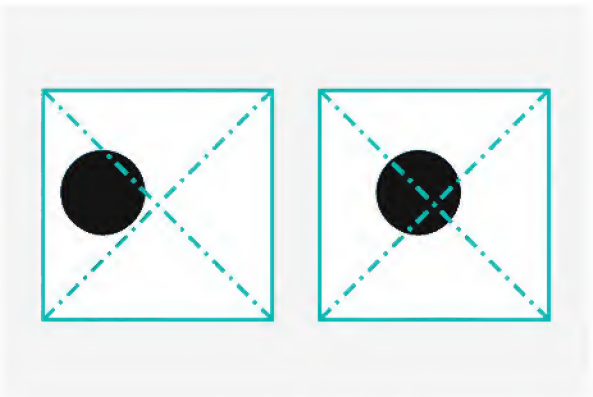
Imaginary center points can produce similar effects. Thus the floor plan of the "House in the Woods" by Kazuyo Sejima is a good example of Kandinsky's notion of double-sound produced by imaginary centers. Here, the two different-sized circles with non-coinciding centers create an exciting spatial composition.

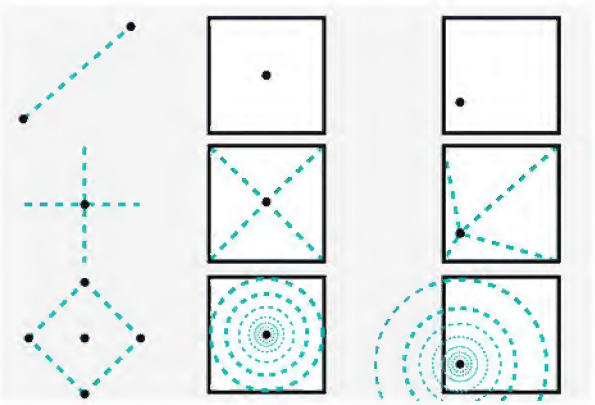
The Chapel of Reconciliation in Berlin by the architects Reitermann & Sassenroth consists of a rammed earth construction as the inner chapel and an outer skin made of wooden slats. The two oval structures are rotated toward each other and their centers pushed slightly apart. Thus the spaces created in between, which each have their own specific functions, are given different room qualities from an occupant's perspective.

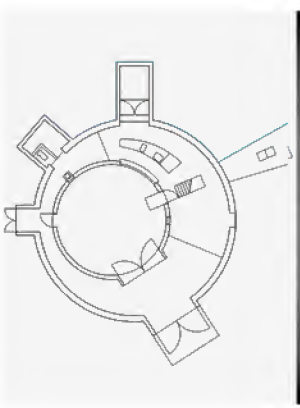
double-sound

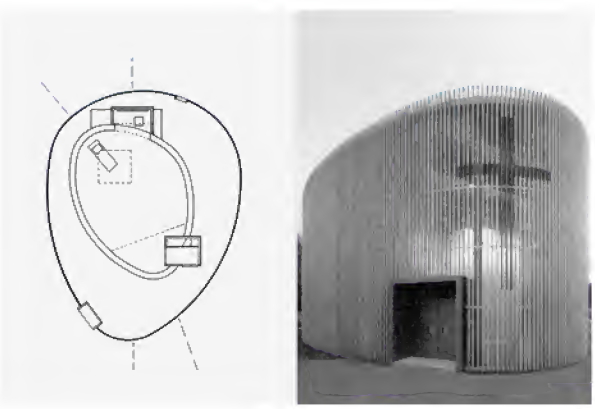












The expansion of the field of energy depends on the form and dimension of the point-element. The impact on its surroundings is clearly perceptible if it is obviously centered and possesses sufficient apparent mass. If the surroundings of such a point-element restrict expansion, the field of energy is contained and cannot spread freely outward. If the field of energy is larger than the open space, then the space between the element and the boundary is compressed.

Bramantes Tempietto in San Pietro in Montorio in Rome stands in a narrow courtyard whose field of energy obviously touches the given boundaries. Shifted slightly off-center it produces a subtle double-sound in this densified space.

bounding

Point 2|2| Pivot and Center. The Vertical

Architectural forms such as towers and cupolas form vertical axes and allude to pivot or center points in the city skyline. A cupola above a building forms a vertex and outwardly shows an expansion of the interior space. The force vectors of the half-sphere point inward and the circular plan and building section show the building's centeredness. Both of these refer to the significance of an interior space below. The center of the dome and the lantern on top define an imaginary vertical axis.

If the building complex is freestanding but not clearly identifiable, as with Berlin's Museum Island, vertical emphasis can be used to articulate corner or end points. Depending on the direction of approach, the vertical axis also makes reference to the division of the waterway. The cupola holding space reinforces the position of the building at the junction.

pivot point

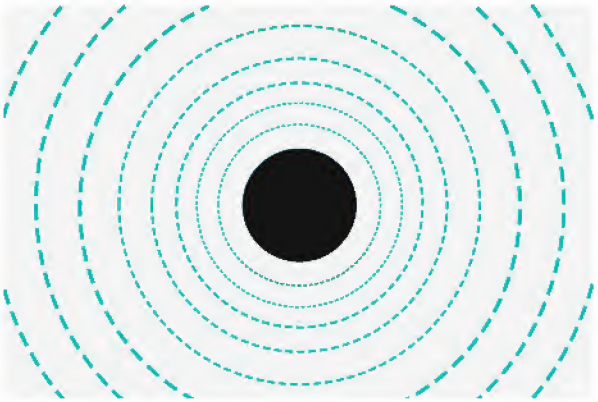
For the dynamics and the flow of movement in the city, these vertical information indicators are very important as a turning or pivot point. The rounded corner of the San-ai Building by Nikken Sekkei Architects in Tokyo's Ginza district does not express a directional preference emphasizing instead the surrounding dynamics with the central axis acting as a pivot point. Moreover, this corner building is the tallest in the adjacent row of point-elements.

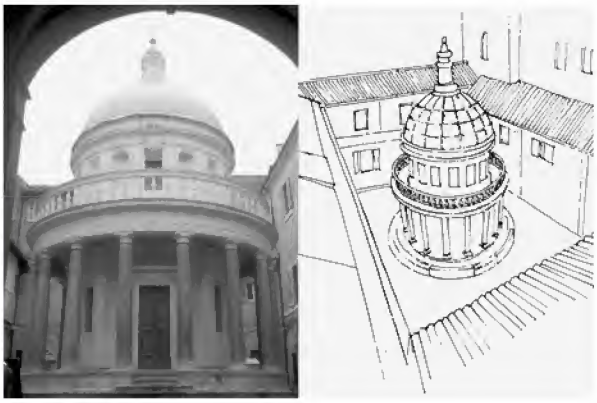
Directional vertical elements make specific reference to the urban context as does Hans Hollein's design for the Generali Tower in Vienna.

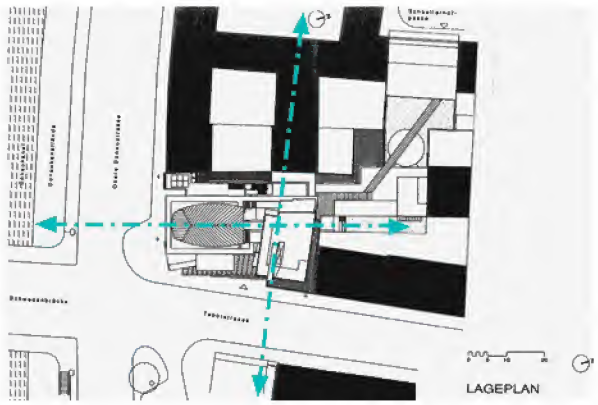
hub

The Generali Tower consists of two virtually upright rectangular solids, each of which takes up the direction of one of the two intersecting streets. The direction of the street running parallel to the canal is indicated by the taller, slanted tower, which is set back further than the other. The lower tower is vertical and stands parallel to Taborstraße, which radiates out from the center of town.

direction



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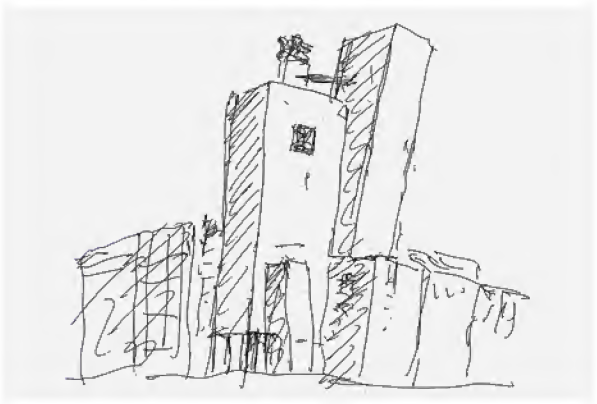


“Ginger and Fred”, a corner building in Prague by Frank Gehry, also suggests a pivot point. Along the direction of the river the rounded corner element extends higher than the rest of the building and provides the basis for the ensuing curve, one doesn’t notice a second, taller and narrower building until one turns the corner into the side street. An obvious axis has been avoided, for from this vantage point one sees two vertical structures. The taller and more centered one seeks to blur the base of its vertical axis with its distorted slanted piers.

base

Point 2|3| Transformation from Non-Directional to Directional

The Pantheon in Rome was built under Hadrian around 120 A.D. and is considered the model of the **central space** for that period. A spherical point-element symbolizes the universe as the cosmos of the gods. A circular opening in the ceiling leads outward and suggests a **vertical axis** that falls from infinite space through this zenithal oculus to the center point of the floor. It is a centered space coincidental with the center of the dome. Moreover, the vertical axis – the central axis of the cylindrical rotunda – traces a line through the opening in the ceiling, straight out into the infinite universe (axis mundi). The viewer experiences the centralizing effect of this space and the upward orientation simultaneously. Jürgen Joedicke provides a detailed treatment of this subject in his book “Space and Form in Architecture”.

vertical direction

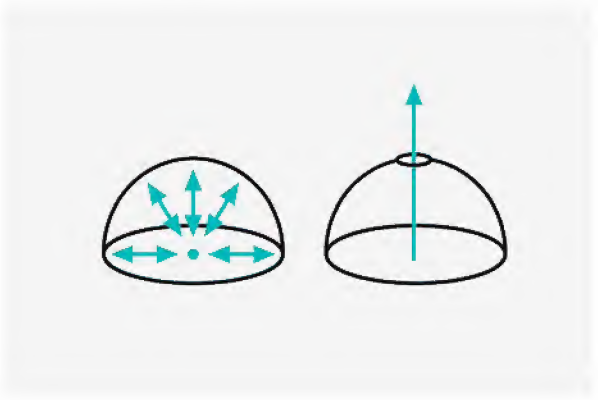
In geometrical terms, it is a half-sphere placed on top of a cylinder. A sphere with a diameter of 43.6 m can fit in the interior volume. The symbol of the universe, is set upon the Earth with the help of the cylinder and represents the merging of the divine and the earthly realms.
A vestibule and portico are attached to define a place for entering the circular space. This produces a horizontal “earthly” entrance axis, whose penetrating dynamics is absorbed by an alcove with a half-dome above it – an apsis – across the cylinder from the entrance portal.
Through the introduction of this horizontal axis and the pediment-topped portal the non-directional round structure becomes a directional building embedded in the urban situation.

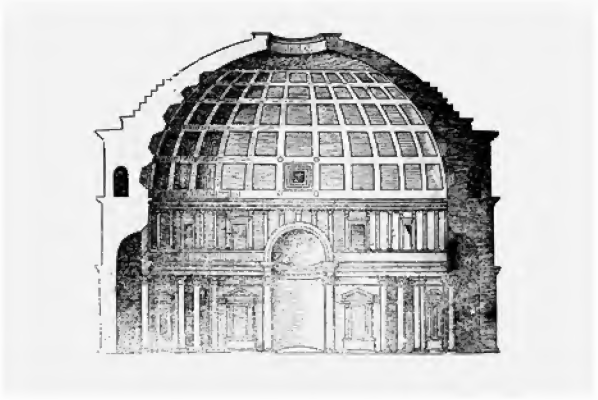
horizontal direction

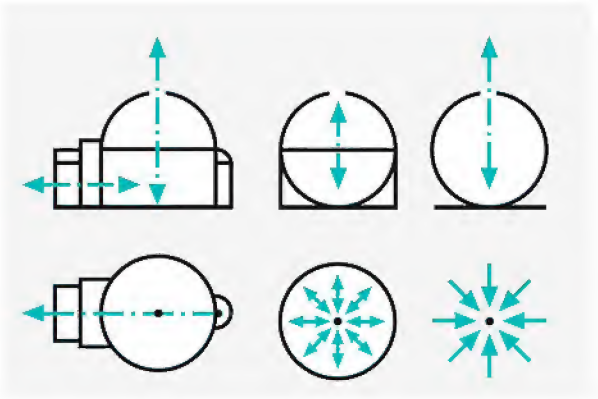
For the New Synagogue in Dresden, designed by the archi - tects Wandel, Höfer, Lorch, and Hirsch, a cube-shaped structure is given a slight upward spiraling twist as it is transformed from following its site boundaries to face the east. The squat, earthbound cube also assumes a vertical dynamics referencing the 'axis mundi'.

The Loisium in Langenlois/Wachau serves as a visitor center and wine tasting facility. This structure also departs from a cube. Steven Holl seeks to soften its monolithic impact with folds and gaps in the outer skin, through which the building can interact with its surroundings. This structure currently stands alone as a solitary building, but it is ready to blend in with a future ensemble.

monolith







Point 3| Space Filter and Spatial Field. The Propagation of Point-Elements

People create organizational systems to orientate themselves in their environments. Such systems can be devised according to various criteria.

Repetition in the built environment is readily recognizable and perceived by most people as calming. This can apply to the element itself or to interrelationships between the elements. Repetition is varied by the qualities of distance, proportion, orientation, and rhythm. Also worth mentioning are **similarities** such as parallelism, rotating, swinging, mirroring, complementary elements, and other related forms.

The repetition of point-elements can produce linear or planar effects depending on their arrangement. Based on proportion and distance the tension of each individual point-element is retained or the new composition assumes the qualities of the next geometrical dimension, in this case line or plane.

Point 3|1| Linear Arrangement. Row

Duplication

The simple duplication of a point-element is all that is needed to suggest a **directional emphasis**. This duplication can be interpreted in different ways depending on distance, proportion, and the way the two elements are linked.

For example, let us take two adjacent columns. If the distance between them is less than their diameter, we do not perceive the individual tension of the columns but instead regard them as a single element of twin columns. This effect is reinforced if the twin columns are an isolated unit in the room and especially if they are joined by a shared capital. The weakening of the centralizing effect and the suggestion of linearity imply a longitudinal and latitudinal axis in the gallery room. Rounded elements appear to be surrounded evenly by space, making them seem merely incidental, an impression considerably less striking than square piers – Galerie V&V (7th district, Vienna, 1985, by Franziska Ullmann).

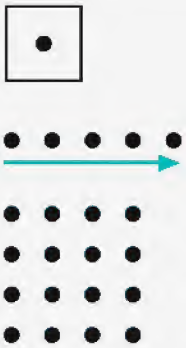
In Venice, two columns mark the transitional zone leading from the urban square to the water's edge. As point-elements they support objects and are thus self-referential as two columns separated by an adequate distance. They also form a clear break, a threshold. Like two mute guards they allegorically demand attention, both upon entering the city, as viewed from the sea, and leaving it. Their linear arrangement marks the two main axes of the piazza and the waterfront and underscores the transition to the waterfront promenade. They both have capitals and octagonal bases. The essential characteristic of this symbol, however, is determined by the round column shafts, which do not obstruct the flow of space in any direction.

If two columns are connected by one or more crossbars, they lose their point-element character and autonomy and become a linear element. Even as a freestanding gate without any further boundaries, as in the case of this Japanese torii, such columns clearly emphasize the passing through and the entering of a different area. Here the imaginary midpoint is clear, as opposed to the columns in front of the Palazzo Ducale, which are left open to the infinite sky. In this case it is delimited by an overhead element creating the symbol of a gate, and by passing through one must bow to the laws of the new zone.

Here we also clearly recognize the **symbolism** of this element as part of a boundary, albeit an imaginary one.

This torii at Myashima is surrounded by water. It announces the transition to a holy temple district and thus a transition from the quotidian to the special.

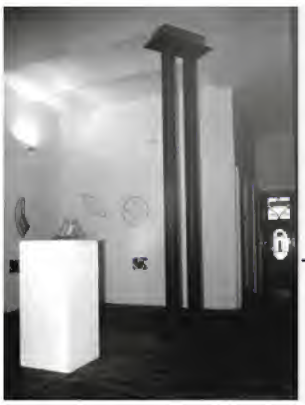
bilateral symmetry

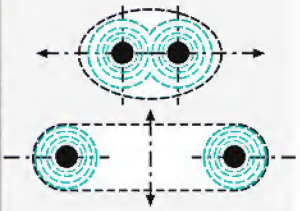


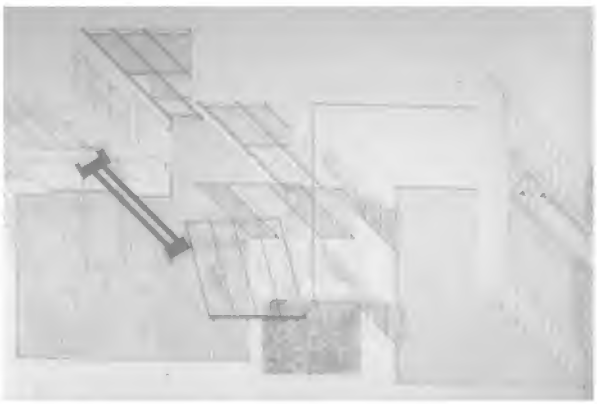
Center point
Hierarchical
Center

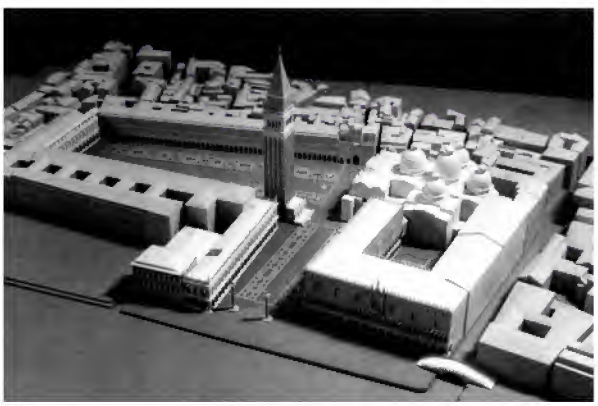
Development
Orientation

Democratic Field









Repetition (Row, Rhythm)

When arranged in a row, point-elements produce a permeable border between two zones. The interaction between the two zones assumes different meanings depending on the form of the point-elements. Columns distribute the energy flows of movement evenly and are neutral to their environment. A square support is the best choice in order to communicate the equal importance of both the longitudinal and latitudinal directions. If one of the two directions is dominant, this is expressed by the choice of such geometrical shapes as the rectangle or the oval.
The orientation of the point-elements emphasizes the linking of zones and the individual effect of the point-elements remains intact. However, if these elements are perpendicular to the flow between the zones, this emphasizes separation and the elements seem like parts of a wall. [See chap. Line 2| Separation – Partition]
Rhythms can be created with homogeneous elements by varying their size and the distances in between.

row

The round supports of the Villa Savoye by Le Corbusier offer as little resistance to the surrounding area as possible, allowing the space around the lower part of the house to circulate freely. The exterior space is intended to flow in as closely as possible to the glazed access zone. These round piers are set in from the edge on two sides and interrupt the continuity of the building's façade. This positioning allows for the continuous ribbon window on the first floor. On the other two sides pilotis are set flush with the outer edge and become part of the first-floor façade.

The arrangement of these piers around the building produces a filtering boundary. The area beneath the first floor is created by that floor's downward projection to the ground. Thus beneath the house a spatial field of tension is defined which is reinforced on the base plane by differentiating the covered surface from the outer grassy surface.

circulating

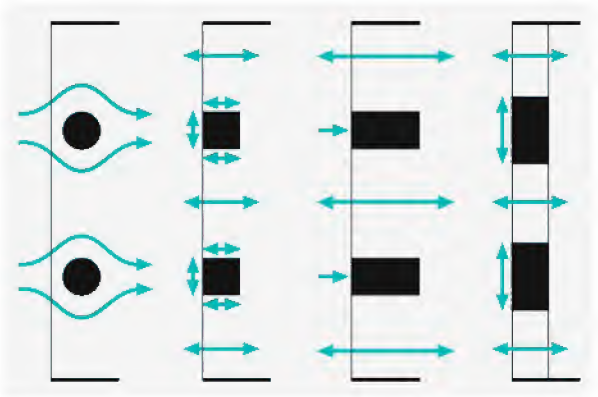
Nearly square pillars prop up one section of the Gumma Museum by Arata Isozaki. They are arranged flush with the outer edge and clearly articulate the downward projection of the building. Both the building volume and the supports are clad in the same material. These arrangements show the designer's intention to make the exterior area underneath a part of the building. The varied floor heights and forms create a kind of artificial landscape that underscores the zone's ambivalent sense of belonging.

fixing

The Dulles International Airport in Washington, D.C. by Eero Saarinen features supports that are both slanted and directed outward. They dramatize an outward movement toward the airfield and a lifting off from the ground.

The downward inflected form of the ceiling condenses the space inside. The upward dynamics of the building's exterior is further emphasized by the roof's upturned edge as well as supports that taper as they rise.

orienting



Non-directional point-elements such as rows of pillars are uncomplicated filters between spatial zones by virtue of the uniform fields of tension surrounding them. The filters emphasize an allocation to one zone or the other depending on proportions and the top and bottom termination surfaces of these elements.

Rafael Moneo's Town Hall in Logorno, Spain, features a row of thin pillars that extends the full height of the building behind it. This serves as a filter for the square in front of it and in conjunction with the roof projection forms an intermediate space between the building and the square. The height and slender form of the round columns encourage the circulation of exterior space up to the wall of the building. The adjacent façade contrasts with a one-story arcade of piers.

non-directional filter

The housing complex at the Gallaratese quarter near Milan built by Aldo Rossi is supported on the ground floor by mighty wall slabs. They are strongly directional elements which underscore the permeability beneath the building.

The slabs are set perpendicular to the main building to emphasize permeability. When viewed along the building's length, however, the overlapping through perspective almost makes them look like a solid wall.

directional filter

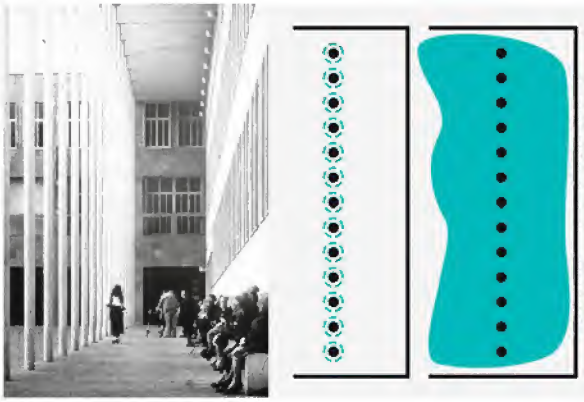
Rhythm

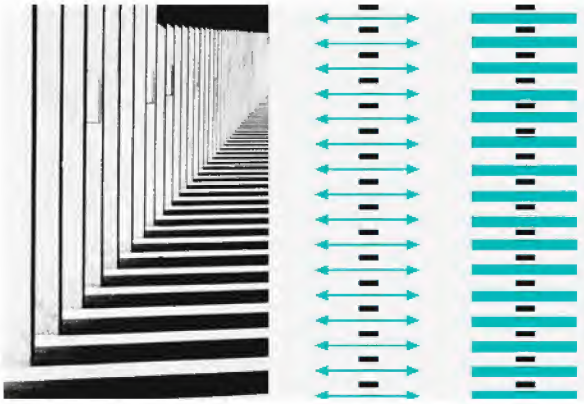
A succession of elements placed in a row can be **uniform**, **rhythmical**, or **irregular**.
Uniform repetition harbors the risk of monotony and loss of orientation. At the Gallaratese quarter, height variation was employed to enhance the repetition and two columns are introduced that change the form and number of the repeated elements.
By adding a second **form** the message of directional permeability is interrupted, and the round oversized columns introduce a dynamics of circulation. The two columns effect a change in **rhythm**. Their mass and their duplication make it clear that this is not a mistake or inaccuracy in the long repetitive row but that this is a conscious sign signaling a barely discernible shift in the main circulation zone. These twin columns do not function merely as filters but through their enormous size also underscore the place where the path changes its course by 90 degrees towards the staircase.

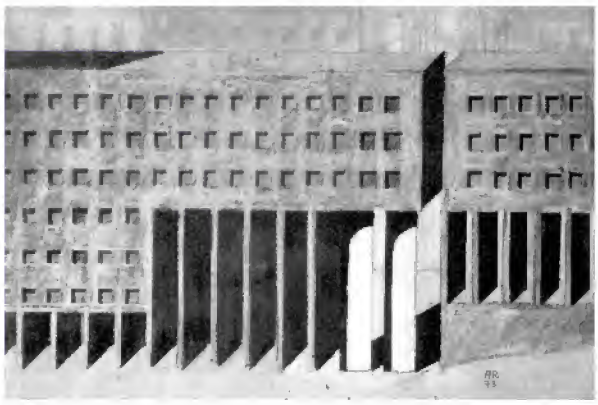
The Gasometers in Vienna's suburbs are arranged in a rhythmical row of point-elements grouped in two pairs of two cylinders.

With the conversion of the Gasometers to apartment complexes, a linear building in the form of a bent shield was added to the centered buildings by Coop Himmelb(l)au.

rhythm







Point 3|2| Spatial Arrangement. Field

Scattering

To orientate ourselves in the world, we choose different degrees of precision to view different things. The more general the topic, the more unspecific and imprecise a statement about it can be. For example, we might call the image to the right “stones in the sand”, but after looking at it briefly, we cannot remember the size or the exact position of the stones. The greatest common denominator is the material itself: stones.

Point-elements of a similar kind are seen as a group. This also applies to the three point-element objects by Coop Himmelb(l)au at the Swiss National Exhibition. Their affinity is recognizable through their similarity as unusually shaped vertical forms. Although there are no discernible ordering principles and none of the three structures are dominant, what does emerge is a distinct location.

Clustering

With dissimilar, point-elements the proximity or relationship between the elements determines group formation. In the first constellation this still hasn’t quite occurred and we have only heterogeneous **distribution**.

In the second example we see groups beginning to emerge as in the image at the top right. As the stones or objects move closer together we try to recognize their organization with the help of ordering relationships or familiar patterns.

proximity

Grouping. Order. Disruption

Even very different shapes can be grouped together in larger sets by virtue of their physical proximity. Our ability to see, perceive, and order plays an important role in how we register and assess architecture. The homogeneity of the material ranks above the heterogeneity of form. We register and categorize great amounts of information at lightning speed with our eyes – a process that exceeds the capacity of any calculation method or computer by far. The relationships are generated on a superordinate level; superordinate in the mathematical sense of set theory. When considering the upper group of shapes, the law of proximity requires us to perceive not six objects but two groups of three. We differentiate between the shapes in the three lower groups based on homogeneity. An important element in determining cohesion is whether we are dealing with a positive or negative form.

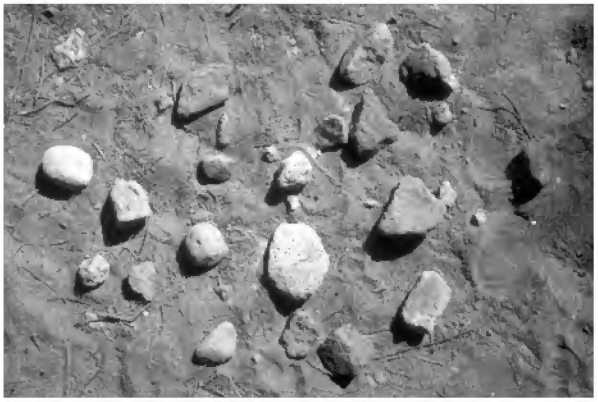
homogeneity

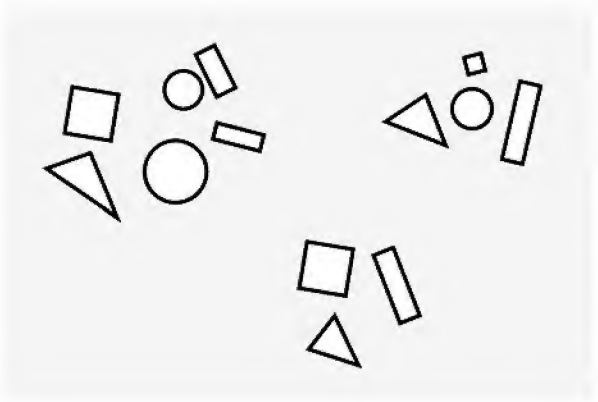
Arrangement

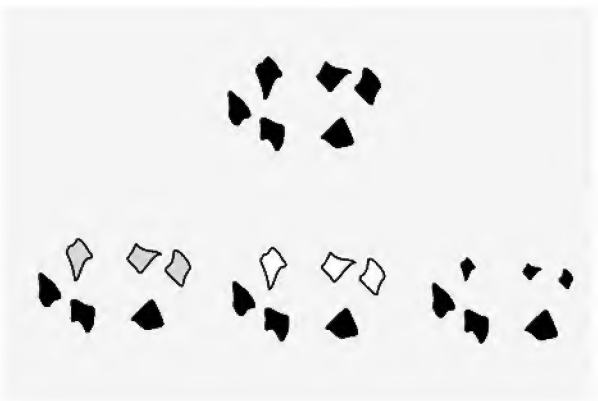
We recognize and interpret a superordinate form if similar elements are grouped together in an easily recognizable regular shape. Point-elements in rows form linear elements, which can in turn serve as the perimeter of a plane.

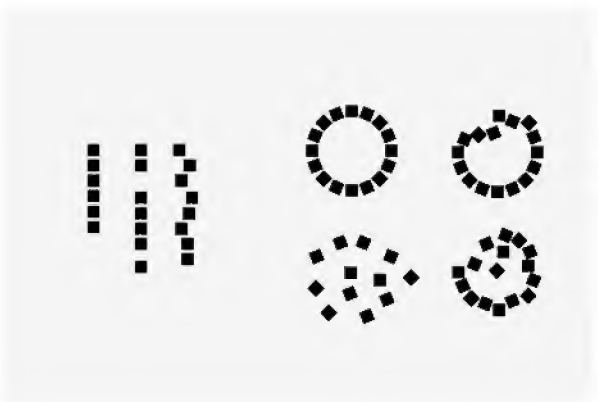
By virtue of their centeredness circular figures are easy to recognize, even if incomplete. The conductor of an orchestra stands at its center from which he can oversee the whole semicircular formation while the attention of the musicians is concentrated on him as the focal point.

grouping









Non-directional point-elements can be arbitrarily placed in relation to other different sized point-elements. These relations determine force of expression and cohesion, as Wassily Kandinsky shows in a study on painting. Kandinsky attempts to analyze the meaning of this seemingly random composition. He calls the left example “Cool Tension Toward the Center” and the right one “Dissolution in Progress”. The individual point-elements generate fields of energy that stabilize the composition depending on the size and distance between the dots. The state of equilibrium and balance determines whether the impression of the composition is calm – as in the left figure – or in motion and striving for an ultimate form – as on the right.

dissolution

We know that the stars, planets, and satellites exist in a highly sophisticated field of tension. They are subject to a cosmic order, which Ives Klein appears to be pondering here. **Revolution** and **rotation** – the Earth revolves around the sun in a certain rhythm, while simultaneously being in **rotation** around its own axis. Two further opposing or complementary impulses also arise in this context: **gravitational** and **centrifugal force**. Gravity holds the world together. It is centripetal, tending toward the center – there is something about it that wants to hold on tight, draw in. Centrifugal force tends to flee away from the center, outwards. It wants to let go and pushes toward the open expanse. Every imbalance in these fields of tension can lead to disruptions.
This basic system is valid on many levels. In the field of psychology Fritz Riemann uses the cosmic system to explain human behavior in his book “Grundformen der Angst” [Basic Forms of Fear].

field of tension

If objects are positioned close enough together, their energy fields overlap and interact. The form of the objects is crucial in determining whether we perceive a single consolidated large form or autonomous point-elements that give the impression of a **collage**, as can be seen in the silhouette of London.

In New York City the direction of the skyscrapers follows a specific plan and the underlying grid gives them a common ordering principle that lets them merge into a condensed superordinate whole.

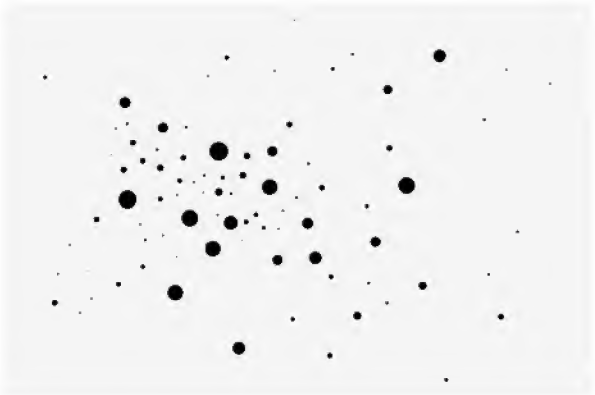
density

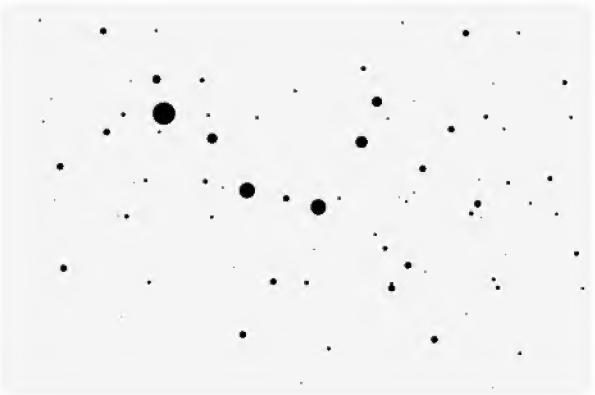
The similarity and proximity of point-elements produces a shared field of influence.

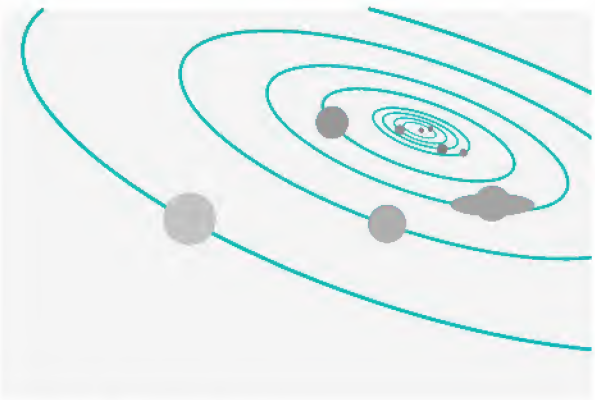
A group of people facing each other creates a very strong field and hardly anyone would step into the “circle” unless asked to do so.

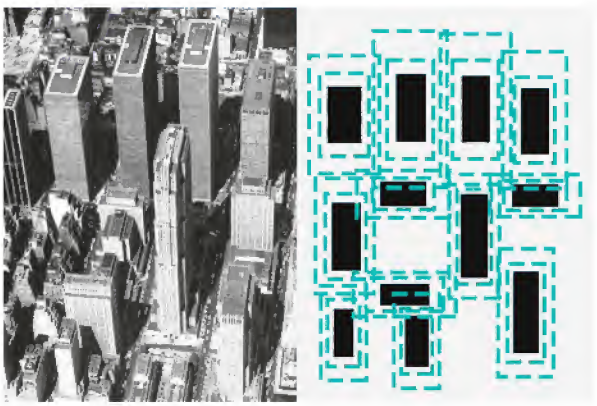
If similarity, proximity, and orientation match up in a certain way, there is a **leap from one dimension to the next**, from the individual object to the overall appearance, a familiar phenomenon found in parades or military formations. The singularity of the individual is replaced by the phenomenon of the mass (cf. Elias Canetti, “Crowds and Power”).

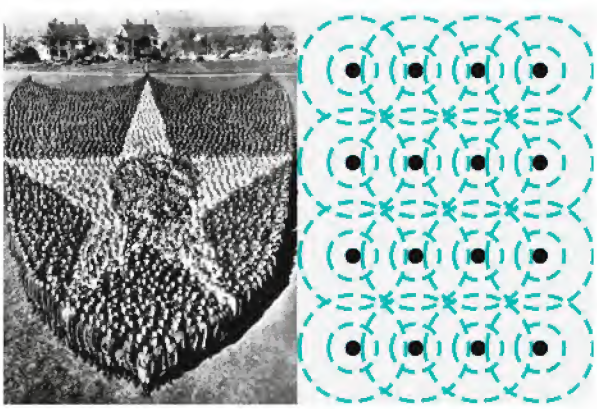
mass











Whether or not each element is perceived as an individual element depends on the proportion and number of point-elements. These trees seem to be rather loosely distributed. The reason for this could be that every single tree or every individual element here can radiate its field of energy without it overlapping with that of the next element. The impression of a forest only arises if there is a sufficient degree of densification and overlapping.

The columns in a mosque are spread evenly throughout the interior space and avoid any hierarchical orientation. A worshipper sitting on the floor is likely to perceive them as a field of columns.

field

The impression is similar to what someone might perceive gazing out at the field of pagodas in Pagan in northern Burma, where many stupas are spread across a vast plain. These point-elements are clearly interrelated by virtue of their vertical orientation and similarity. There is no apparent logic to their arrangement. They build a field of energy. [See chap. Line 1|2|1| The Phenomenon of Connection] The individual structures are perceived as parts of a cohesive field despite their irregular distribution because other than the pagodas no other buildings are present in the unstructured landscape. The similarity and relationships of the elements combine to form a superordinate unity.

The force fields of the elements extend in a planar direction and spatially. On various scales they probably have an effect similar to the related fields of **macrocosm and microcosm**. Rupert Sheldrake calls them *morphogenic fields:* similar structures suggest similar or analogue properties. This also applies to various levels of consideration.

constellation

Peter Eisenman erected slightly tilted concrete blocks in parallel rows on a rolling plane for the Holocaust Memorial in Berlin. In plan the blocks are all the same size (2.38 x 0.95 m) but their heights differ (0 to 4.7 m). Their strict arrangement creates a vast unified field. The 0.95-meter-wide pathways form a symmetrical grid accessible to visitors.

Point-elements can form an ordering structure in a logical grid and exhibit a defined field in an area of unstructured building even if the elements are heterogeneous and their design varies. Parc de la Villette by Bernard Tschumi is a good example of this.

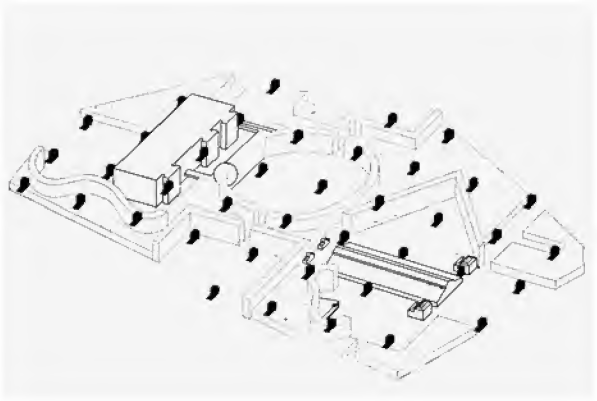
order

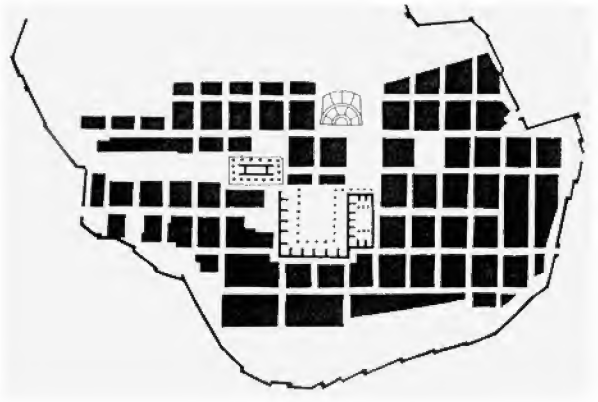
Too much order creates monotony and a loss of orientation. The principle of disruption can be applied consciously through an alteration of the proportions or size relations of buildings. This will also emphasize differences in importance as can be seen here in the plan view of the city of Priene.

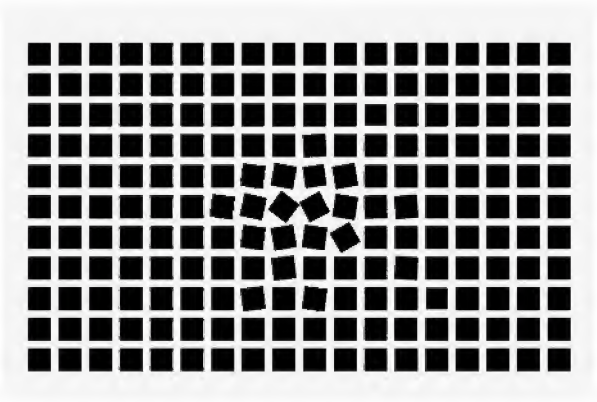
In our longing for order we find regularity pleasant. We have developed a sophisticated sense for detecting the slightest divergence as unsettling.

Visually, every change in orientation or proportion, no matter how small the scale, is perceived as a disruption that can, however, also serve as a welcome orientation aid.

disruption







Line

A line has a beginning and an end – by contrast, a point is timeless and directionless.
A line separates the spatial continuum – a point marks a position in space.
A line distinguishes between a here and a there – a point establishes a center.

This is why it is **dynamic**, **directional**, and **directing**.

dynamic

Formation through **motion**
Kandinsky derives line formation from the painter's perspective: *It is the track made by the moving point; that is, its product. It is created by movement – specifically, through the destruction of the intense self-contained repose of the point. It is a leap from the static to the dynamic. The line is, therefore, the greatest antithesis of the most fundamental pictorial element – the point. Viewed in the strictest sense, the line can be called a secondary element.* [PLP 57]

Formation through **tension**
A linear element can also arise through a series of point-elements and the tension between them. A more or less interrupted or continuous line is produced depending on the proportion of these point-elements and the distances between them.

track

Line 1| Guide – Track – Path. The Linear Element Itself. On the Line

Translated to our physical environment, the idea of the line becomes materialized as a linear element that assumes the features of a line. Depending on scale, a linear element from the perspective being discussed here will be depicted in the plan drawing as an actual line or linear form. In so far as this linear element can be walked upon and we are **on the linear element**, we recognize it as a trail, path, street, creek, or course of a river.

If, however, we are standing **beside the line** in the area surrounding it, we find that every linear element divides space into this side and that side, into a here and a there. Point-elements in a linear arrangement suggest a path without completely interrupting the plane, in this way they form a permeable divide. Getting rid of the intermediate spaces eliminates permeability, which results in a hermetically closed line of separation. [See chap. Line 2| Separation – Partition]

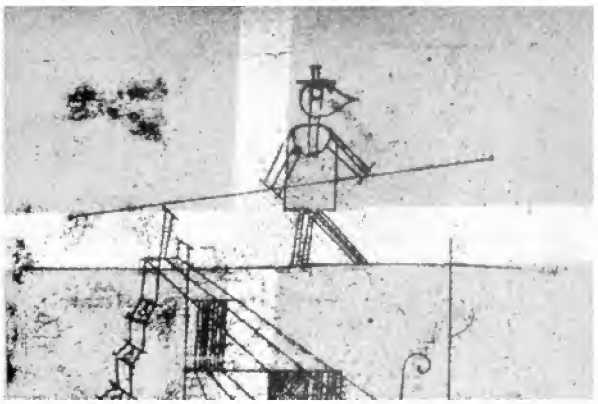
Line 1|1| Manifestations of Linear Elements

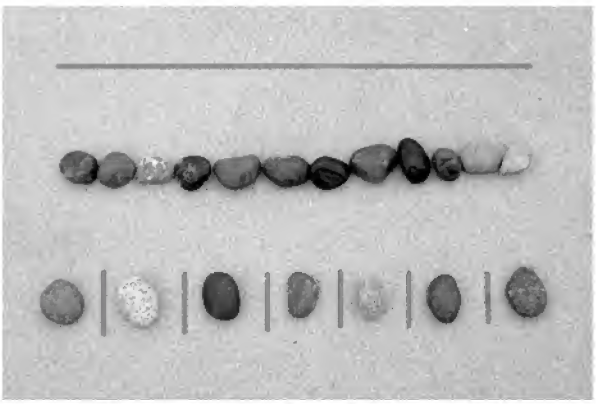
One possible material equivalent of a linear element is a piece of string. If we imagine widening this string, the result is a ribbon or strip. Trails or paths as examples clearly illustrate the characteristic features of linear architectural elements.

Natural
We can find linear elements in nature in the form of rivers and valleys. The constant movement of the water defines a linear, sometimes branching, track in the landscape.

Artificial
Paths as linear elements facilitate movement and serve to connect two places.

path





A linear element must be of a certain width if people are to be able to use and walk on it. It also has to go from being a one-dimensional line to a two-dimensional long narrow plane. We tend to ignore the two-dimensional aspect, however, if the essential characteristics and features of a linear element are dominant. These are **direction**, **beginning and end**, **dynamics**, **movement**, and **experience of time**.

movement

For an installation in conjunction with the exhibition “Skulptur. Projekte in Münster 97” simulated handrails made of wooden planks were suspended from the trees. Visitors could follow these guides for the duration of the exhibition. Afterwards, the handrails were removed and a square spiral worn into the ground by the flow of foot traffic was left behind. This track is an example of how indispensable the time factor is in connection with movement for the identification of a linear element.

The linear element stands for the course of **time** and in this way constitutes a contrast to the point-element which symbolizes stillness and the absence of time.

course of time

Movement sets a **direction**. In the drawings for a house for a jogger by Mark Mack the paths cross on the roof and suggest both longitudinal and transverse directions.

When Günther Domenig converted the former Nazi Party Building in Nuremberg into a documentation center he pierced the building with a steel structure that begins inside as a gradually inclined path whose physical body ends in a sharp, cantilevered outlook platform. The **dynamics** generated by the direct path and arrow-like form extend well beyond the object itself and into the former Nazi Party Rally Grounds.

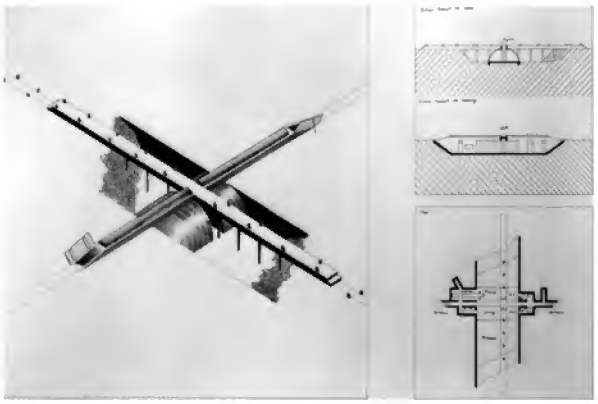
direction

A linear element expresses direction of movement and connects two points: **beginning and end**.

The Echigo-Matsunoyama Museum of Natural Science by Tezuka Architects is a linear building whose end points are architectonically elaborated by a tower and a coiled end. [See also p. 91]

The installation which passes straight through Castle Solitude near Stuttgart plays off the central axis of the sala terrena, emphasizing the looking through and looking out over the downward sloping lawn. The linear structure starts inside the palace with the upper surface flush with the floor and extends horizontally outward. The path along the top seems like a runway into the landscape.

beginning and end



Line 1|2| Formation of the Line Through Dynamic Forces

One might wonder, after looking at the preceding examples, how it is possible to recognize linear elements despite their varied forms of manifestations. Wassily Kandinsky and Paul Klee contend that, as with the point-element, what is responsible is not the exterior form but the tension inherent in the linear elements. According to them, line formation is based on two principles of dynamic forces: **movement** and **tension**. In both cases we can differentiate between two types of lines: **straight lines** and **free-form or curved lines**.

Kandinsky uses rigid lines to characterize inorganic objects, like in the representation of what he calls the graphic rendering of stone structures.

straight line

Line 1|2|1| Rigid Lines: Straight Line

Kandinsky distinguishes lines based on different formative forces: *The forces coming from without which transform the point into a line can be very diverse. The variation in lines depends upon the number of these forces and upon their combinations. In the final analysis, all line forms can be reduced to two cases: 1. application of one force and 2. application of two forces: a) single or repeated, alternate action of both forces, b) simultaneous action of both forces.*
IA. When a force coming from without moves the point in any direction, the first type of line results; the initial direction remains unchanged and the line has the tendency to run in a straight course to infinity. This is the straight line whose tension represents the most concise form of the potentiality for endless movement. *[…]* [PLP 57]

horizontal

Line of Sight

There is a visual connection between the object and the viewer.
Light is radiation emitted from a source in the form of electromagnetic waves. When they hit a body, they heat it and they reflect, producing a sensation in a part of our eye.

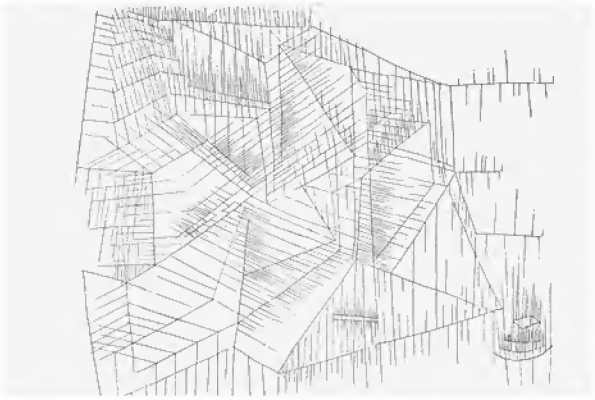
The straight propagation of light emitted from a point source will produce a cone of rays in a homogeneous medium. The image of an object is projected onto a surface based on this physical law. Everything in our environment is made visible through this principle.

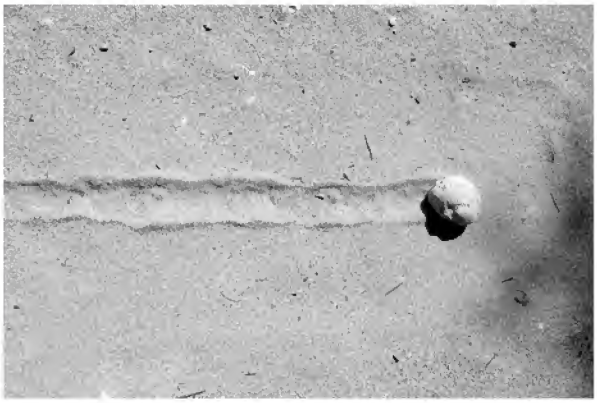
ray of light

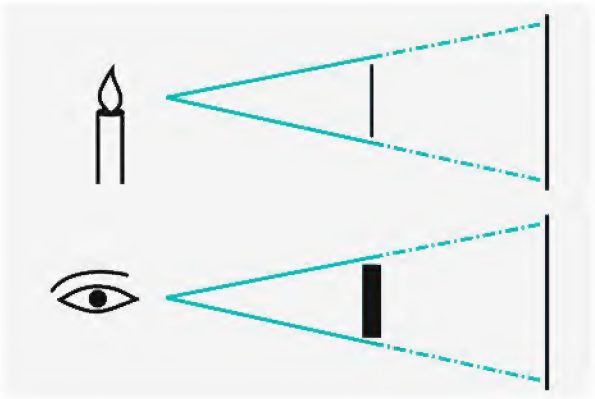
The projection process is comparable to the natural process of vision. The straight rays of sight or projection from the object hit the picture plane resulting in a representation of the object. Each ray of sight hits the picture plane at a single point, the image point of the object image. Whether the object lies in front or behind the image plane is irrelevant. The representation of perspective is based on these principles and on the conscious application of lines of sight and visual axes as diagrammed for the layout of the Acropolis of Athens. The properties of rays of light or sight also enable us to recognize whether several objects are lined up toward a vanishing point.

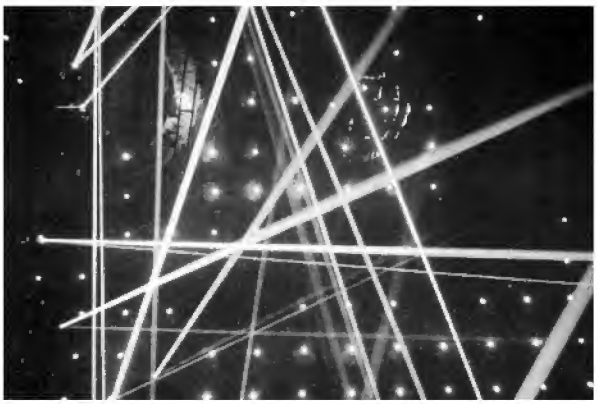
The Parthenon stands out (because it does not lie along the axis!). [Le Corbusier, travel sketchbook]

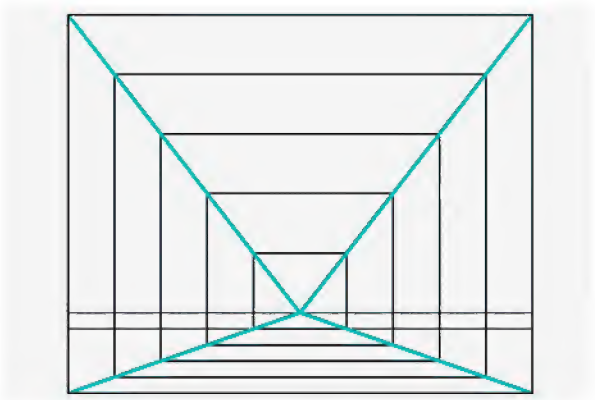
ray of sight

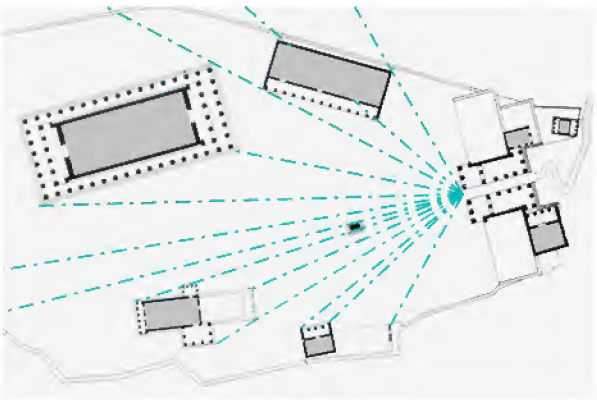












Imaginary Lines. The Phenomenon of Connection

A line is a dynamic element. It has a beginning and an end.
This special definition of a line means that it marks at least two points in space. A point, by contrast, indicates only one specific position in space.
The dynamics of the **direct connection** between a line's beginning and end point can even be felt if the line does not physically exist. It only takes two similar point-elements recognized as signs to produce a tension that a viewer will interpret as a relationship. Tensions can arise between real objects as well as between imaginary points and imaginary vertical axes. Paul Klee's definition confirms that a point in a state of tension in respect to a second point will generate a line. This phenomenon plays an important role in our perception and gives rise to imaginary lines.

tension

The arrangement of imaginary axes can be applied as a **system of ordering and reference** in architecture and urban planning. Pope Sixtus V and his architect Domenico Fontana erected obelisks in Rome at important sacred sites, emphasizing individual points in the urban fabric in such way that the viewer perceived a relationship between the point-elements. The imaginary lines defined at the beginning and end points by the obelisks determined the future axes along which the city of Rome would develop and set up expanding connectivity. The obelisk on the Piazza del Popolo represents one of these end points. [See chap. Point 1|3|2| Slightly Directional Point-Elements]

relationship

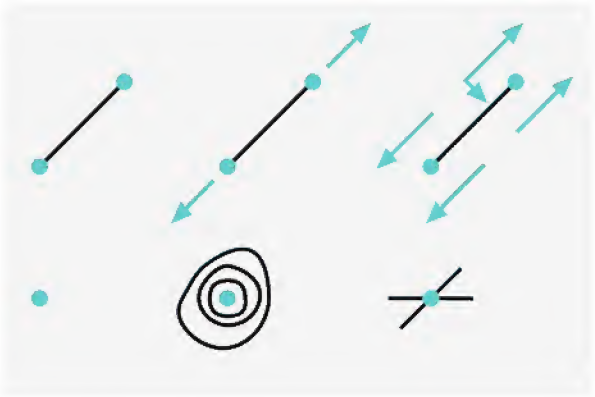
Even with formally differing objects like the Capitol Building and the Washington Monument the direct connection across the open area of the National Mall in Washington, D.C., is clearly evident. The vertical orientation and symbolism of the obelisk corresponds with the imaginary vertical axis of the center of the dome of the Capitol Building. The objects and their imaginary connections support and reinforce each other.
The symmetrical axis of the object coincides with the visual axis of the complex, thus forming a clear and direct monumental axis, which is redirected into the vertical plane at its terminal points. As an imaginary line between two points, this axis suggests a secular purpose. A ceremonial axis can be created by physically building on to or framing this connection. More on this later.
The nearly 170-meter-high obelisk erected in 1884 serves as a pivotal point between the Capitol and the White House.

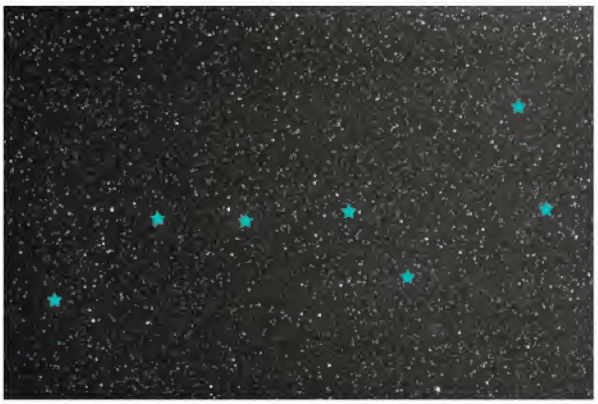
connection

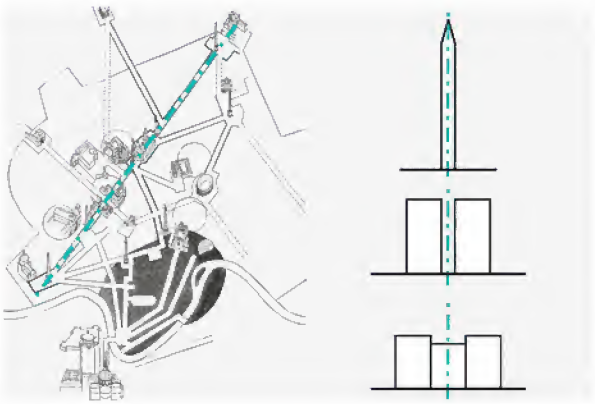
Diptych – Triptych

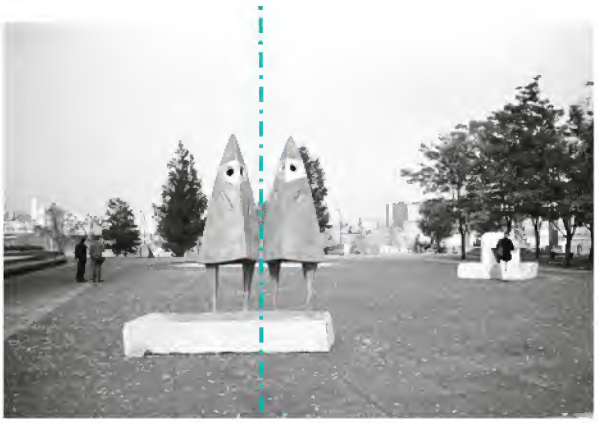
Reference can be made not only to centered, point-elements, but also to other objects that suggest a center. Examples of this can be found in twin structures or symmetrical buildings and configurations. A single object along an imagined line marks an intermediate or a terminal point.
Twin structures (diptych) arranged perpendicular to the imagined line suggest a path through the center as if through a gateway. An odd-numbered repetition (e.g. triptych) produces a middle section. A raised and closed-off structure results in an end point or a stopping point. An open middle section underscores a sense of passage. In Munich, the wide road leading to the Nymphenburg Palace is flanked by rows of buildings that represent important points of reference along this primary axis – for example, the obelisk at its real center or the propylaea on Königsplatz located on its symmetrical axis.

vertical before horizontal









Axes

Parallel linear objects generate a field, which we will deal with in more detail in the chapter about planes. The buildings facing each other form through their vertical axes of symmetry the horizontal central axis of the overall complex. This produces an important connecting line that can determine and give hierarchical order to a complex.

An imperial axis was created between the Schönbrunn palace and the Gloriette in Vienna based on plans by Fischer von Erlach. The Gloriette is an imperial garden pavilion that marks the border between the artificial French garden and the natural environment of the hunting grounds of the imperial pheasantry.

monumental axis

Axis Distribution and Weakening

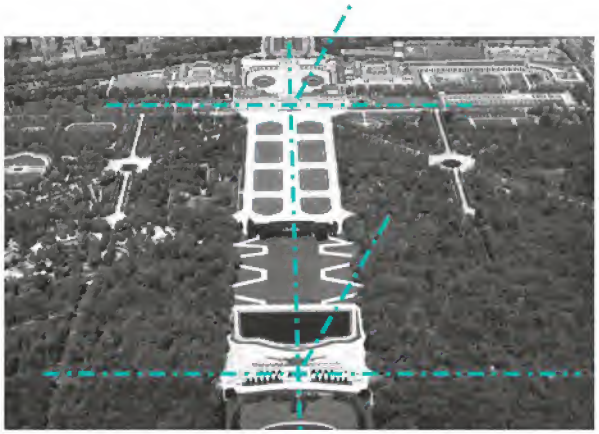
Ferdinand von Hohenberg's design of the Gloriette consciously incorporates and transforms the imperial axis. The raised middle section of the Gloriette makes reference to this monumental axis (triptych), while its three identically wide round arches distribute the force of the main axis to the three equally dominant openings. The lateral sections with four arcade arches on each side serve as additional filters. This arrangement distributes the significance of the central imperial axis across to the adjacent pheasantry as one passes through the arches. The perpendicular oval pond in front of the Gloriette further weakens the central longitudinal axis.
The Gloriette from behind seems like a building that has been positioned sideways along the edge of the grounds because the palace as a point of reference is not visible. The remodeling of the Café Gloriette by the author focused on the intersection of the imperial central axis and the filtering transverse axis. The interior was left open, but the café is subdiveded into four zones for kitchen, bar, and two areas with seating facilities.

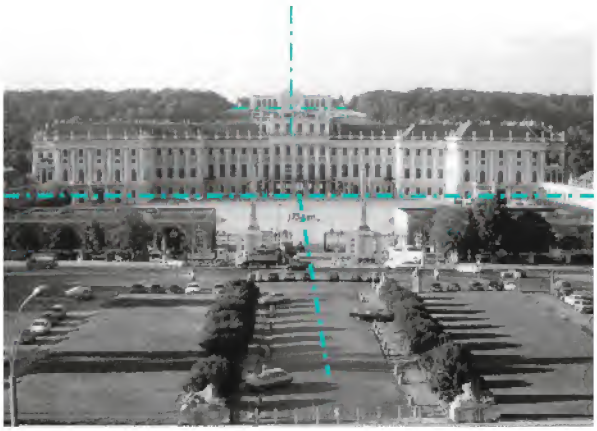
Shift

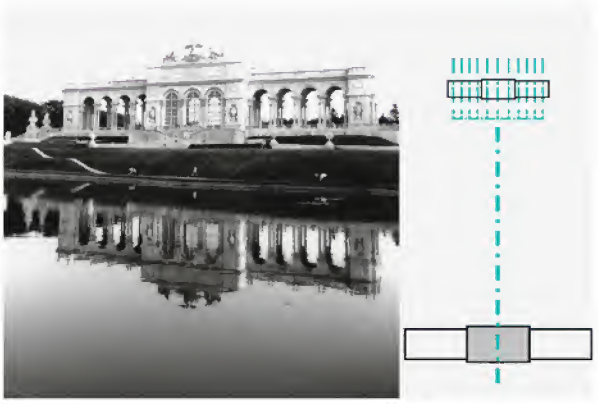
The government district is arranged along a large longitudinal central open space in the new capital city Brasília designed by Lucio Costa and Oscar Niemeyer. A large empty space at the center is defined by various building types flanking its long edges.

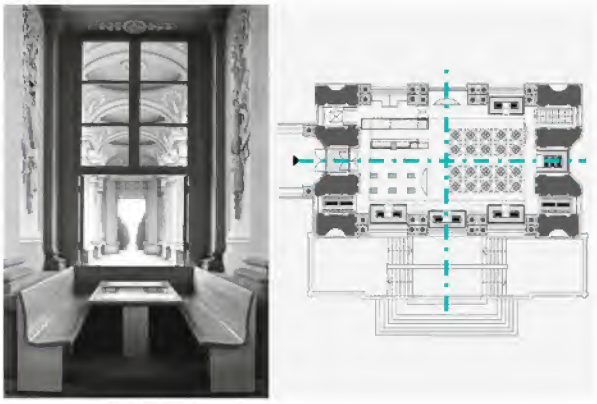
shifting the axis

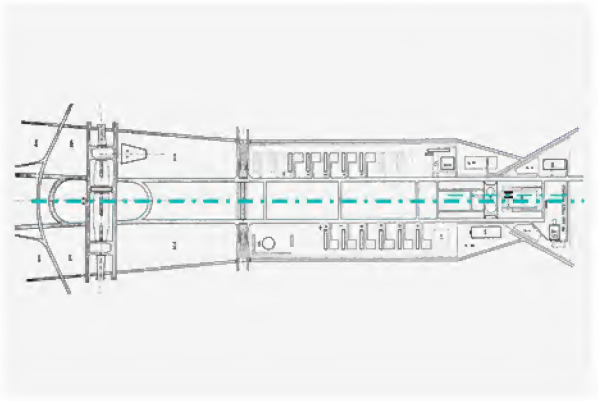
Along the longitudinal sides of the central open space are rows of brick-shaped administration buildings. They are arranged with their narrow sides facing the central space, thus appearing as point-elements in a linear constellation. They are set in groups that are staggered in respect to each other. The "counterclockwise rotation" generated in this way counteracts the formation of a ceremonial axis. The Square of the Three Powers is located on one of the narrow sides of the central space. The horizontal axis of a gateway is implied in the vertical symbolism of two tall buildings. These buildings have been shifted off center, and the axis running between them does not correspond to the central axis of the complex. This generates a conscious pulling apart of the important central zone, which symbolically extends the hierarchy into a wider, perhaps more "democratic" area.

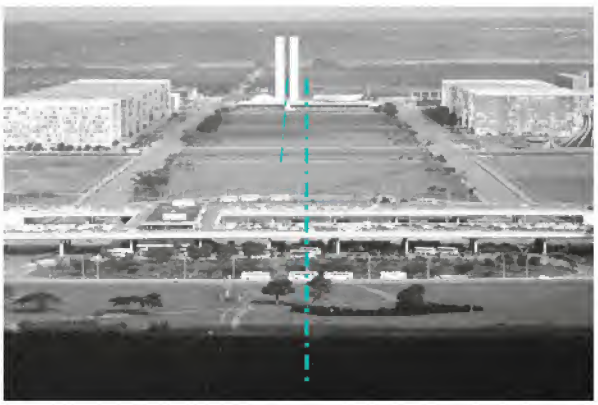












The Diagonal. Special Form – The Straight Line

In painting Kandinsky characterizes the following kinds of straight lines on the picture surface [see chap. Plane 1|4|1| Basic Plane in Painting]: 1| the **horizontal line** as the most concise form of the potentiality for endless **cold** movement, 2| the **vertical line** as the most concise form of the potentiality for endless **warm** movement, 3| the **diagonal line** as the most concise form of the potentiality for endless **cold-warm** movement, 4| the **free straight line** that lies outside of the center.

Horizontal and vertical lines as we perceive them represent different forces. A **horizontal line** expresses a **continuous progression**, while a **vertical line** represents **direct ascent**. The **diagonal** (vector line) apparently brings together **both forces**. Like in painting, upward movement to the top right is perceived as a familiar, positive direction, at least in the European cultural sphere. This rendering of “Himmelsstiege”, a project by Ebner-Ullmann, 2001, takes advantage of these dynamics.

A line diverging from the orthogonal path at a certain angle can have a special meaning.
The horizontal path to the stage of the Japanese Noh theater is a diagonal approach. This path leads from the real present into a different world. The actor leaves himself behind and is transformed into a different being.
This diagonal approach to the Noh stage is the only departure from the strictly orthogonal layout of the Buddhist temple in Miyashima.

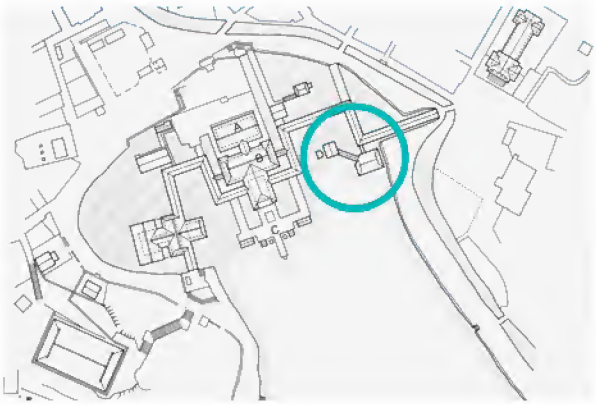
diagonals

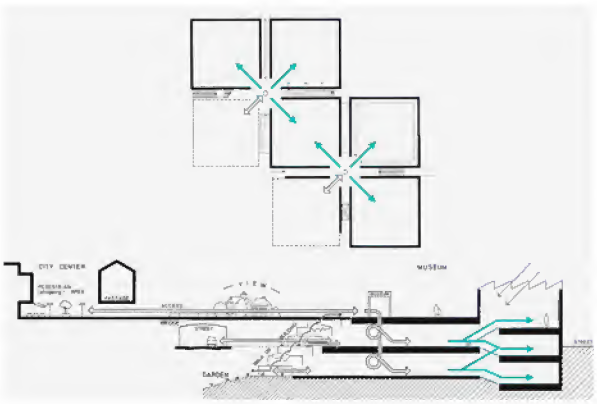
The dynamic effect of a diagonal line in the otherwise regular pattern of a grid of right angles usually adds strength. Approaching a space from a diagonal direction automatically opens up the corner and at the same time divulges the maximum depth of the room.
At the Museum Abteiberg in Mönchengladbach, Hans Hollein pushes the individual exhibition spaces apart, creating intermediate zones that are used to join paths and views. Access to the exhibition spaces via the spatial diagonals creates large-scale spatial areas with continuous walls unbroken by doorways. The open corners are points of intersection that provide an expansive view of several exhibition spaces at once. The landings of the stairs and pedestals serve as platforms and junction points where the diagonals intersect.

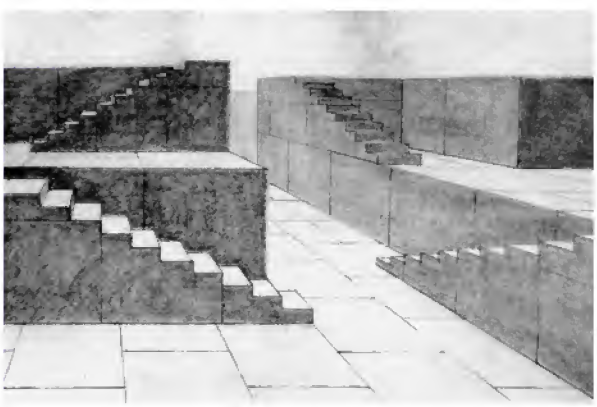
steps

We enhance the diagonal’s dynamics by extending it into three-dimensional space. The simplified and almost spatially abstract stage design by Adolphe Appia and Emile Jaques-Dalcroze in Hellerau demonstrates the special dynamics of these spatial diagonals in the form of ramps and steps. This revolutionizes the previously static stage concept.

ramps




CITY CENTER
MUSEUM
GARDEN



The steps to Michelangelo's Piazza del Campidoglio and the wide stairway to the church of Santa Maria in Aracoeli in Rome have a strong impact as dynamic urban elements.

While the "rising" dynamics is allowed to spread out on the Piazza del Campidoglio, the energy seems to bounce off the façade of the church. The square in front of Santa Maria in Aracoeli seems therefore small and limited.

The staircase leading up to "Bom Jesus do Monte" in Braga, Portugal, is a monument in its own right. It starts with a direct approach to the pilgrimage church. The middle section, which is perpendicular to the main axis, is dramatized by a rhythmic zigzag pattern that brings the pilgrims together and back apart again. The church itself disappears along the way, but as the visitor reaches the top platform, it suddenly comes back into full view.

spatial diagonal

The dynamics of the spatial diagonal can also be clearly experienced in a building's structure. The Rusakov Club in Moscow, built in 1927 by Konstantin Melnikov, was conceived as a workers' clubhouse to help spread the socialist idea, educate and entertain the people, and function as an assembly hall. The slanted volumes that house the grandstands in the three multipurpose rooms physically jut out on the building's exterior. They are modeled on the idea of a megaphone and intended to intensify a sense of "shouting out" and agitation.

The foyer area of this cinema complex in Dresden built by Coop Himmelb(l)au, with its stairs and platforms, extends diagonally upward to strengthen the dynamics of ascending to the theater entrances. The direction of the volume's extension intentionally accompanies the high energy of the busy urban street.

dynamizing

Line 1|2|2| Rigid Lines: Angular Line or Angle Formation

The simplest forms of angular lines consist of two parts and are the result of two forces which have discontinued their action after a single thrust. [PLP 69]

Kandinsky characterizes the acute angle, which forms an equilateral triangle, as being highly active and possessing the warmest color, yellow to orange. To him, the right angle is the most objective and also the coldest, it forms a square and is assigned the color red. The obtuse angle is characterized as clumsy, weak, and passive. It can best be described by the circle and is associated with the colors purple and blue.

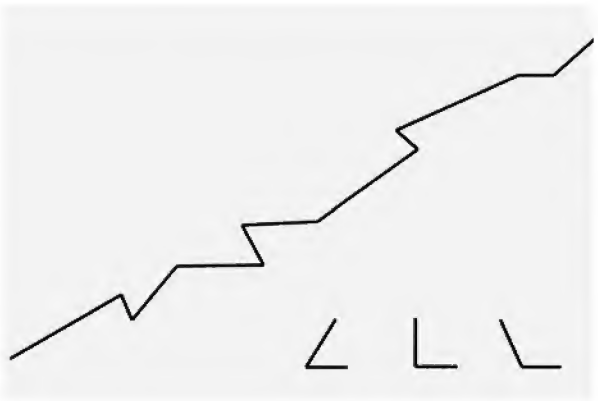
Seen from the inside, angular forms produce different dynamic forces. An **acute** angle acts confining, a **right** angle gives a precise and protected impression, while an **obtuse** angle seems inviting until it overextends itself too generously and loses its footing.

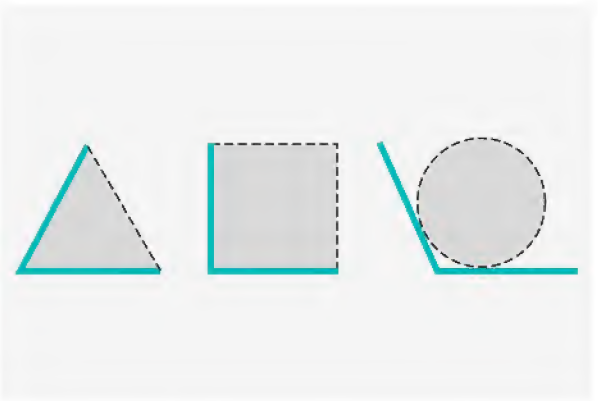
angle

The angular line shows no clear direction. In its graphic manifestation it loses its one dimensionality and becomes a plane. Linear objects in angular or folded form seem planar or two dimensional in the same way. The angular line is used to avoid direct approaches or alignments. The zigzag shifts of a bridge, which change the direction of motion, afford various views of the Chinese garden making it appear larger than it actually is. The zigzag form also seeks to keep evil spirits from finding their way across.

The plan by Daniel Libeskind for the expansion of the Jewish Museum in Berlin is based on the concept of a path connecting different sites on a map of the city. These connecting lines formed the figure of the building. Although a line drawn through the middle of the plan view would definitely indicate a dominant direction, by using a zigzag line Libeskind was able to avoid direct references to the neighboring building volume. He also created a variety of exterior and intermediate spaces.

angular line





Line 1|2|3| Free or Flexible Lines

Paul Klee sees the curved or slack line as the not yet executed tension between two points, as opposed to the straight and taut line, which establish a direct connection.
The point that sets itself in motion. What was in the beginning? Things moved so to speak freely. […] The point is not dimensionless but an infinitely small planar element, an agent carrying out zero motion, i.e. resting. (1) – Apply the pencil and shortly a line is born. (2) – The point as a primordial element is cosmic. […] The point as an intersection of paths. (3) – As a point of impact the point is static. (4) – Tension between one point and another yields a line. (5) – Not yet discharged (abstract). (6) (The line is slack) – Discharged. (7) The most general cause, therefore, is a reciprocal tension, a striving for two dimensions.
[Klee, The Thinking Eye, 19, 103ff.]

curves

Klee distinguishes between a number of different line forms:
saw-toothed, **serrate**, **scalloped**, **dentate**, **sinuate**, **fretted**, etc.
They are expressive of many forces and thus have a more dynamic effect. They impact the environment beyond the actually projected line. Curved and angular lines fill a surface area that generates an imaginary center line in the dominant direction or an imaginary center point.

In her project Tatiana Bilbao used the curved line to create such an expressive pathway to reach the Bicentennial Monument in Culiacan, Sinaloa in Mexico.

The Phenomenon of Curvature

The emerging field of energy of an imaginary center of an implied circle is especially strong and most perceptible in a curved line.
In this way, each curve suggests an imaginary center in addition to the concrete linear form. With convex forms the center lies beyond the outer boundary; with concave forms the center lies within the curve.

The structure of curved lines is governed by the laws of geometry. Thus, for example, every round arch has a fixed center and is determined by its radius. Curved lines shift direction at their inflection points. Depending on their curvature they suggest a closer or more distant center.

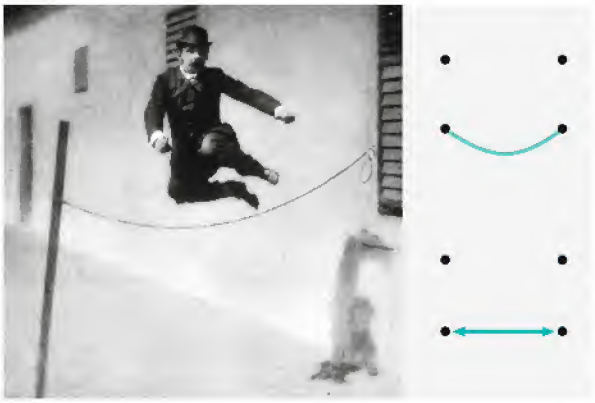
suggested center

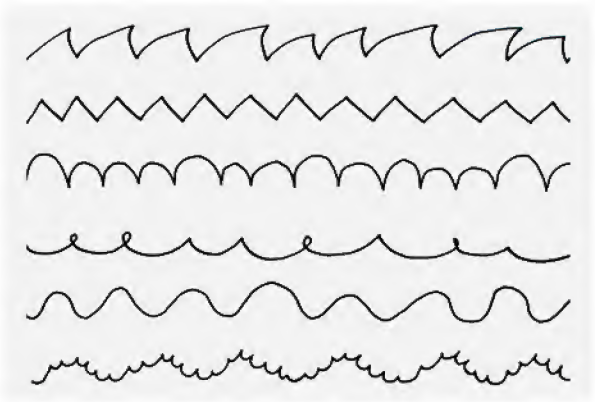
Umberto Boccioni, a member of the Italian Futurist movement, writes the following about sculptural dynamism. *If the Impressionists think the object is a nucleus of vibrations that appear as color, then to us Futurists the object is, in addition, a nucleus of directions that appear as form. The state of mind of the sculptor in the characteristic potentiality of these directions.*
[Der Lärm der Straße, 23]

In the sand, ocean waves leave tracks of their constant motion.

Gerardo Dottori shows curved lines as the expression of a heightened dynamics in his painting “Ciclista”:
All is moving, all is racing, all is being transformed at a rapid pace … [Der Lärm der Straße, 375]

curves





The direct connection combined with a climb is arduous and is only gladly accepted with the help of escalators. A curved upward movement seems to ease the climb with a twist such as that of a spiral.

Curved lines can also extend three-dimensionally. The original Aargauer Kunsthaus built in 1956 by the architects Loepfe, Hänni, and Hänggli was expanded in 2001 by Herzog & de Meuron. The “iconic staircase” of the old building was retained as a spatial sculpture.

The Guggenheim Museum in New York by Frank Lloyd Wright generates its sculptural form in the building’s interior from a spiral ramp that opens outward as it rotates upward.

Inside the transparent dome of the Reichstag building in Berlin, Norman Foster arranged forward and reversed winding spiral ramps that separate the flow of ascending and descending visitors but are smoothly interlocked in their formal appearance.

spatial spiral

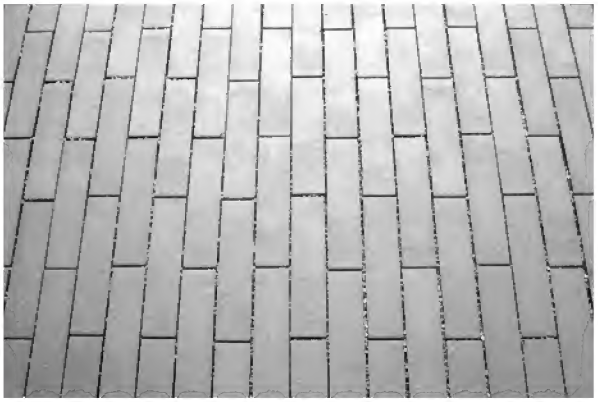
Line 1|2|4| Special Form – The Drawing Line

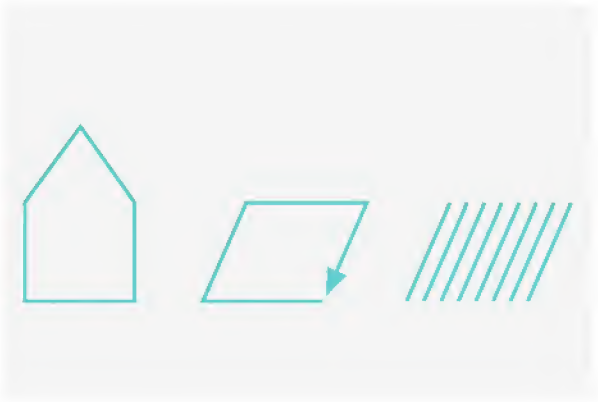
What is most important from the point of view of this book are the dynamics that emanate from the architectural elements and their inner tension in relation to humans. Therefore, a **vertical** such as a column or tower acts **as a point in plan view** and as a centered point-element with all its relevant characteristics. According to Francis D.K. Ching the line is the most important element in design. It can serve to join, link, or separate elements, it can function as the edge or contour of planes, or be used as hatching to articulate different planar surfaces. But he also describes the line as a vertical element based on apparent form and visual assumption. This contradicts the vertical dynamics of architecture from a human point of view. For me the line is not a vertical element.
The bamboo plants in the Ginkaku-ji temple garden in Kyoto give the appearance of a group of point-elements, whereas split, bent bamboo stalks create lines in plan view, which form boundaries for the visitor.

As long as one is on the line or within a linear element, one will experience the phenomenon of connection. Other characteristics come to the fore if one is beside the line.
If the **line is continuous**, it produces a **plane**. Rudolf Arnheim defines a line as an **object line**, **contour line**, or **hatching line**, among others.

If objects lose their corporality due to atmospheric influences, as in this image of the hills of Guilin, China, they are defined only by their contours. This seems to produce a flat landscape, like a backdrop.

outline and contour





Line 2| Separation – Partition. The Linear Element and its Surroundings. Beside the Line

If we leave the path and view the linear element from its surroundings, we are no longer confronted with the phenomenon of connection but with that of separation or partition between this side and that side, between here and there.

Between different materials a line represents the border and serves as a clear **distinction** between them.

border

The constant action or abrasion of flowing water can cut into the terrain, form valleys and canyons, and break up the landscape.

The watercourse itself constitutes a linear element with a beginning, an end, and a direction. Seen from the shore, however, it acts as a separator. A bridge becomes necessary – a transversal linear element connecting the two sides.

Changes in terrain can be underscored by dramatic waterfalls. Iguazu on the border between Brazil and Argentina is such a case.

gap

A line within a homogeneous or uniform material represents an interruption, a crack, a separation that can, spatially speaking, lead to a fissure or break.

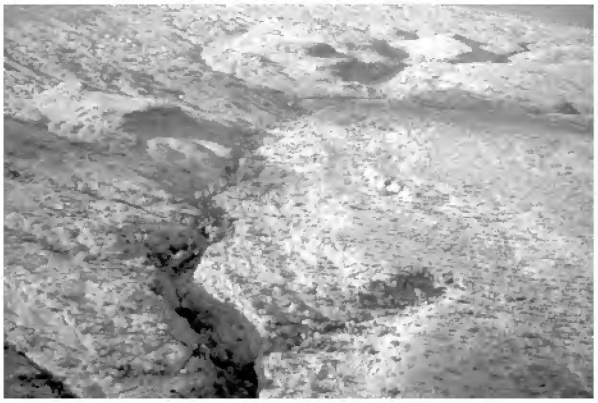
Construction joints are used to emphasize the placement of individual units of material.

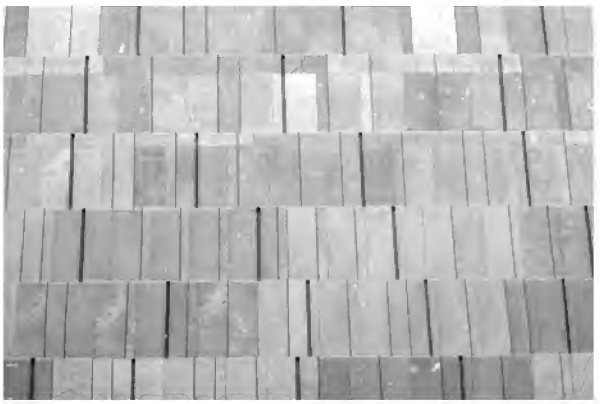
joint

Terrain ledges arise not only through destructive forces but also result from sediment deposited by flowing water. The sinter terraces in the lake district of Band-e Amir in the northern highlands of Afghanistan are an example.

Artificial terrain ledges are part of the rooftop walkway over the laboratory spaces of the Neurosciences Institute in La Jolla, California, designed by the architects Todd Williams and Billie Tsien. These ledges are formed by slanting walls that enclose space on the inside while defining a spacious courtyard on the outside.

ledge





Line 2|1| Separation
If the linear element extends in a vertical direction, thus assuming a third dimension, a clear spatial separation is produced. A continuous space can be subdivided in this way, and this separation creates two sides.

The American artists Christo and Jeanne-Claude clearly illustrate the **phenomenon of separation** with their installation "Running Fence" (1972–76), which marks an arbitrary boundary interrupting the seemingly endless landscape in Sonoma County and Marin County in California.

boundary

Human history shows that man placed point-elements as markers for orientation purposes. Between these markers were emptiness, expanse, surrounding space, and field.
People became aware of the space in between when these point-elements were located closer together. Large forms in the landscape often served ritual purposes.
During the neolithic revolution, when agriculture emerged some 9,000 years ago, humans tried to build boundaries within the secular world resulting in fortification walls as a defense against a vast, undefined outside world. This can be seen in the notion of the Tower of Babel (etching by Athanasius Kircher). [See chap. Plane 2|1| Slightly Directional Planar Elements. The Phenomenon of the Square]
The circular ditches from the Middle Neolithic Age at the excavation site near the Lower Austrian village of Kleinroetz (6800–6500 B.C.) do not show clearly whether the facility is sacred or profane.

sacred and profane

As a linear element the Great Wall of China not only represents a physical object but an imaginary one as well. It is a **drawn line** that stands for **separation**, for **here and there**. It is a marker without interruptions.

The wall does not follow the most direct course but is fitted to the landscape. Its form follows the landscape but nevertheless can appear arbitrary. This linear element divides the people **beside the line** into two groups belonging to one side of the wall or the other.

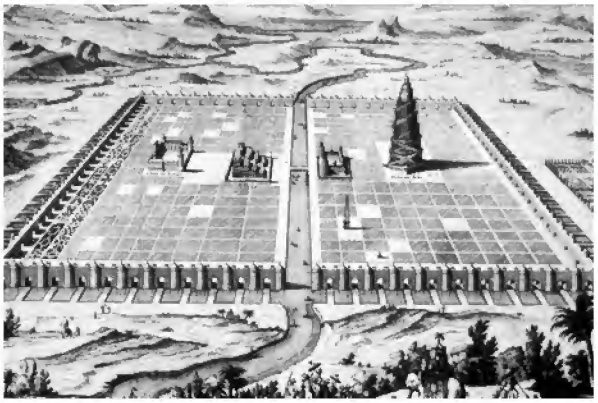
For the people **on the line** it represents a path with a beginning and an end and with specified access points.

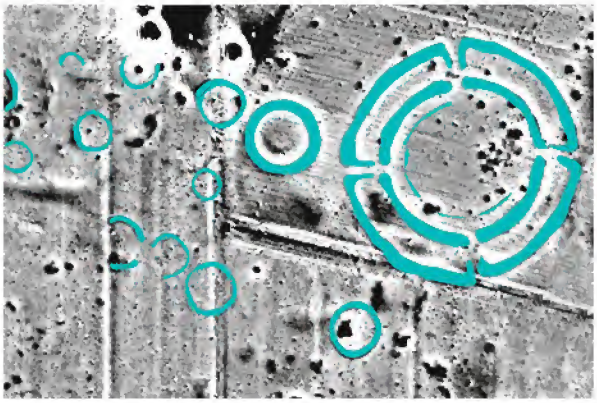
here and there

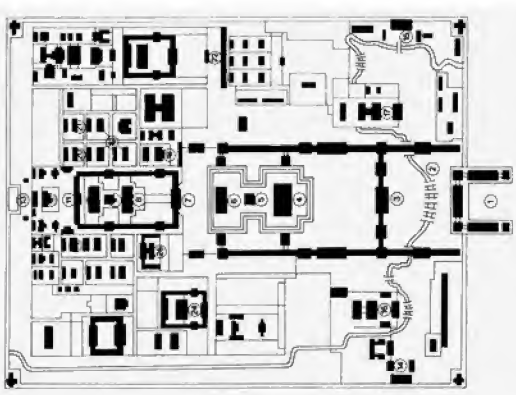
In Beijing, the capital of China since 1420, the model of an imperial residence conceived 2,000 years earlier was reproduced on a rectangular site measuring 13.3 x 12 km.

A ritual 8-km-long axis runs through Beijing, cutting through the Chinese City, the Tartar City, the Imperial City, and the Forbidden City. The walls of these cities as well as of large buildings divide this axis into many segments that mark the different levels of the ritual passageway. An artificial hill protects the Forbidden City from ominous forces from the north. Cosmological laws govern the course of the passage through the multiple and sequential relationships of inside and outside of the walled-in and interlocking spaces.

inside and outside







Line 2|2| Partition
The basic linear element in architecture is the **wall**.

Line 2|2|1| Division of Space

Mies van der Rohe's Barcelona Pavilion for the 1929 International Exposition addresses the interplay between linear elements. Individual walls divide space into areas that allow the spatial continuum – evoke it even. Through their parallel and free positions these walls allow space to circulate while differentiating spaces. It is only through the convergence of several of these linear elements that corners and angles are produced which stabilize the spatial continuum.

dividing

The wall is formed – from our point of view – out of linear elements extending vertically or into the third dimension. The plan view is important because it shows the dynamics of the linear elements.
We can begin a discussion with several types of linear elements as a basis for walls.

Continuous Line

If the line derives from the movement of a point, it is not difficult to imagine the (accompanying) implicit dynamics. A point-element such as a vertical pole being continuously pushed in a given direction or in two opposite directions can make a wall and clearly illustrates this dynamic effect. A **hermetic boundary** in the form of a **closed**, **physically impenetrable wall** is produced. One can walk along it and one must reach its beginning or end before crossing to the other side.

continuous

Interrupted Line. Mediating Partition

If our point of departure is a linear element consisting of a succession of point-elements, the result is a **mediating boundary** of a **physically permeable wall**. Only by *eliminating the space in between* (Günther Fischer) can this be turned into a closed wall.

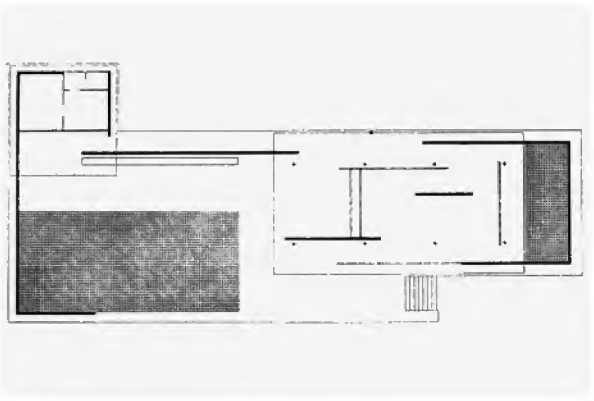
The wall is canceled out in El Lissitzky's "The Room for Constructivist Art". In his first demonstration space built in 1926 he reduced the walls to a series of vertical point-elements. Deep vertical slats were used to support his notion of the desired effect of pictures hanging freely in the room rather than being perceived as 'planes on planes'.

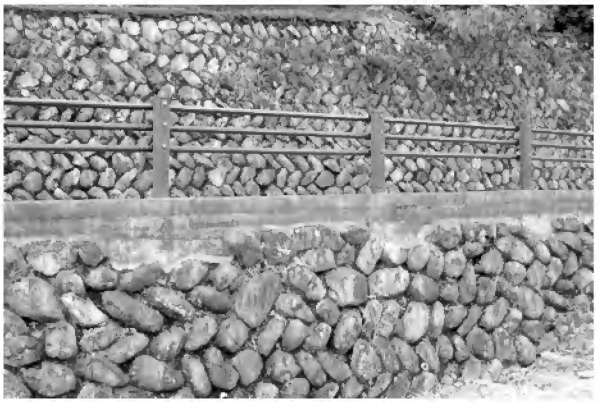
interrupted

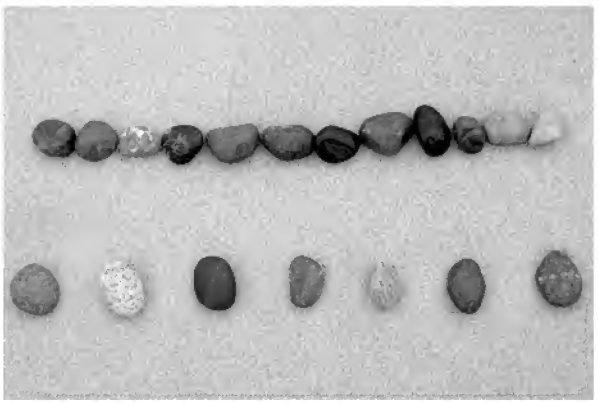
The many-layered exterior walls of a Japanese house offer varying types of permeability. The outermost layer consists of a wooden lattice, which when viewed head-on affords a glimpse into the garden. From the side it appears closed. The second layer consists of sliding paper walls. They are translucent and allow the play of light and shadow. They offer visual rather than physical protection.

Walking along the village streets on Miyashima Island in Japan this transparency provides mediating impressions of the private lives of the villagers. In very subtle ways they react to the various demands for physical or visual separation without hermetically closing off space altogether.

mediating







Luis Barragán uses individual wall slabs like **screens** to partition space. In his fountain in Los Arboledas these linear elements appear in parallel arrangement, but are staggered on different levels in respect to each other. Here a spatial area is alluded to with the water functioning as a connecting base.

Walls can be employed not only as space-defining but also as load-bearing structures.
In this way Shigeru Ban uses cardboard columns in a Japanese country house by positioning them in dense rows. The wall is reduced to point-elements but combines defining, forming, and bearing functions.

space-forming

Dom H. van der Laan researched pillars and pillar thickness, or diameter, in relation to the spaces and compared these with a continuous walls in terms of space-defining and structural functions. *[…] To maintain architectonic value, walls should not be monolithic. They must present themselves as assemblies of gathered pillars whereby each element maintains its own form. The arrangement of the whole is always based on a juxtaposition of wall parts with openings and solids, each one of which is articulated in superposition with the others.* [Der architektonische Raum. 1992, E.J. Brill, Leiden, p. 154]

The slanted pillars in a gymnasium in Basel by Herzog & de Meuron emphasize the notion of the wall more than vertical pillars would and more clearly distinguishes the corridor zone from the playing area/courts. The slanted arrangement of the pillars underscores movement along the corridor.
Viewed from the playing area, the arrangement of the pillars gives the impression of crisscrossing laces.

load-bearing

Every linear element proposes a direction. Standing on the line, one has two options: to move either toward the beginning or toward the end – to go “with the current” or to cross the current.
When moving beside the linear element, one is guided along the form in a parallel direction by the dynamics of accompanying. Unlike the circular point-element, which appears the same regardless of the direction of approach, the way one perceives the linear object changes drastically when one approaches it from the side instead of moving along parallel to it. It becomes an obstacle, which one must overcome in order to continue, must be circumvented or crossed.
This applies to linear building volumes like the Hiroshige Museum by Kengo Kuma where he also addresses the dematerialization of the wall.

length- and crosswise

We perceive a linear building in much the same way we perceive walls. A familiar example of this is the Pedregulho housing development in Rio de Janeiro in the São Cristovão District built by Eduardo Reidy in 1946 (with landscape design by Burle Marx). The curvilinear form of this 260-meter-long structure with its 272 apartments traces the contour of the hill, establishing subtly varying spatial relationships. Two bridges provide access to a partially open ground-floor space that is supported by pilotis. This well-ventilated and covered circulation level affords an amazing view and offers a place for children to play. Additionally, social facilities such as daycare and kindergartens as well as administration functions are located here. The two lower levels house one-room apartments and there are two types of duplex apartments each with four rooms on the levels above. Various boundaries for use as exterior walls were designed to let these spaces draw the surroundings into the interior, control climate, and prevent the building volume from appearing hermetically sealed off.

along

Line 2|2|2| Connection of Space. Opening – Threshold

Interruptions or openings are necessary in order to cancel out the separating effect of a linear element and to establish a connection between what is in front and behind.

A threshold and lintel have been built into the wall and lie flush with the wall itself. Depending on their shape, they are inviting or repellant. The round moon gate in the wall of a Chinese monastery is an expressly lateral opening that encourages visitors to cross the threshold, which emphasizes the entering of a special area.

In one of the courtyards of the 21st Century Museum of Contemporary Art in Kanazawa, designed by SANAA, Sejima and Nishizawa, a glass corridor penetrates the "Green Bridge" built by the French artist Partrick Blanc. It is actually a 14-centimeter-thick wall covered with some 100 plant varieties selected to suit Kanazawa's climate.

opening

Thresholds are especially pronounced when they mark different areas of power.

The entrance to the courtyard of the imperial palace in Kyoto is a lengthwise rectangular opening. A high threshold, heavy doors, and a markedly low lintel mean that one must make oneself small as one steps across – a gesture of obeisance or submission.

A similar effect is produced by the projecting roof above the entrance gate to the Topkapi seraglio in Istanbul.

threshold

The symbolic significance of a gateway is so strong that its effect remains unbroken even if only remnants of the linear element still exist. Thus one enters this Bolivian village through the gates of its former fortification wall even though there are other openings.

In the auditorium of the Neurosciences Institute in La Jolla, the lateral fin-like design of the openings and the extension of the floor outside the front of the building reinforce the connection between interior and exterior and suggest a cool, shaded foyer within. A raised threshold was purposely avoided.

gate

Special Form – The Crossing

Crossing a linear horizontal element creates an intersection on the same or different levels.

The primary impression of the crossing is not one of separation but of connection; it leads from A to B, two points lying at either side of the linear element – e.g. the pedestrian bridge by Future Systems in London.

Since some streets in the ancient Roman city of Pompeii were also used for drainage, stepping stones were installed for crossing.

crossing

Line 3| Direction of Space – Guiding Space. The Propagation of the Linear Element

The propagation of a linear element can take place in the planar or spatial dimension. **Duplication** and **row** and multiple sets of linear elements can occur in either **free**, **parallel**, or **crossing arrangements**. [See chap. Plane 1|3]

Line 3|1| Duplication

The duplication of a linear element in a parallel arrangement strengthens the effect of orientation. Each fork follows a deflection resulting in a splitting and a multiplying of what was formerly an unambiguous dynamics.

Duplication in Parallel Arrangement

The effect of a parallel arrangement is so strong that through the symmetry of the situation we perceive an imaginary, projected, and dimensionless center line that guides us along.

dimensionless line

The duplication of linear elements when transferred to the spatial dimension, produces a linear, directional space. If, as above, the space-bounding elements are also hermetic, this creates a pathway that possesses all the attributes of the line as discussed at the beginning of this chapter, namely, beginning and end and a clear direction.

The power of the dynamics depends on the proportion of the bounding elements to the pathway in between. With a straight arrangement, the importance of the end point is reinforced by the perspective effect – as in the Gumma Museum, Japan, by Arata Isozaki or in the courtyard of the Salk Institute in La Jolla by Louis I. Kahn.

perspective

Duplication in Curved Form

With curved pathways one's view of the end point is constantly changing. The path gives no information about its actual length and arouses curiosity.

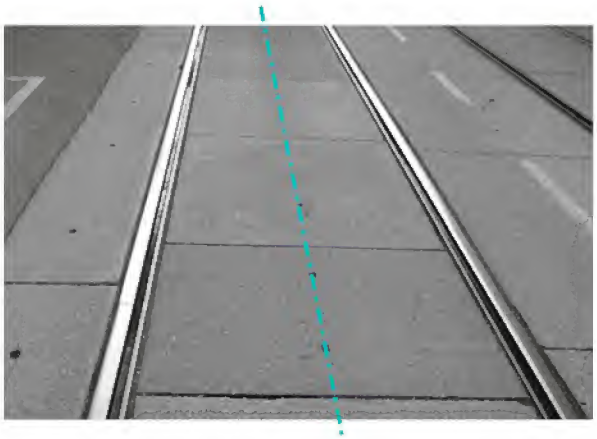
This is made clear by a sculpture by Richard Serra located in Berlin in a more or less undefined open urban space. This work consisting of two steel walls positioned close together makes a power of densification perceptible. It is easy to see where the path leads from the outside. But if one enters the sculpture, it can produce an interesting tension-filled sequence with no immediate view of the exit.

densification

Duplication in Free Arrangement

In another object by Serra named “Clara Clara”, the curved steel walls are not parallel but convex in respect to each other. This emphasizes and makes experienceable the themes of narrowing and widening. Like in fluid mechanics, narrowing produces a kind of propulsion effect and acceleration. Not until the boundaries are widened does an expansion of these dynamic forces and a reduction of acceleration occur.

widening



Anisotropy of Space

The dominant pull of gravity makes the space we live in asymmetrical. Geometrically, there is no difference between up and down; dynamically, the difference is fundamental. […] Anisotropy of space [is experienced] by means of two senses, kinesthesis and vision. Kinesthesis, the sense that reports on the physical tensions active in the body, interprets gravitational pull as weight. [Arnheim, The Power of the Center, 10] With this in mind, the gravitational axis of every object is recognized as the top priority. This applies especially to the viewer himself. The **visual experience** differentiates between a horizontal and vertical orientation. The horizontal cross emphasizes its central symmetry and marks a specific spot. The middle is clearly recognizable as the intersection of two lines. In the vertical figure the observer relates to the vertical due to his fundamental awareness of his own gravitational axis. Our anthropomorphic view gives precedence to the vertical axis and divides the horizontal line into two parts.

Even in the horizontal plane there is a hierarchy of axes.

Every imaginary central axis creates the inevitable dynamics of a direct and straight line between the observer as the point of departure and a real or infinitely distant end point. That is why in architecture the **axis in the viewing direction** always dominates over an axis transversal to this.

Along the Avenue of the Sphinxes in Luxor the rows of figures face the central axis and watch and accompany the visitor.

the power of the center

Line 3|2| Row

Non-Directional Elements

An arrangement of multiple linear elements composed of point-elements produces a main axis and lateral axes running between the point-elements. Arrangements of non-directional point-elements such as columns, might make it difficult to identify the main and subordinate axes if those longitudinal and lateral axes seem equally important from the viewer's standpoint. In order to establish clear hierarchies additional measures can be taken. For example the path along the main axis can be built longer, wider, or higher than those along the subordinate axes. The exalted cupola symbolizing the vertical (axis mundi) was added in Baroque churches to mark the imaginary end point of the main axis.

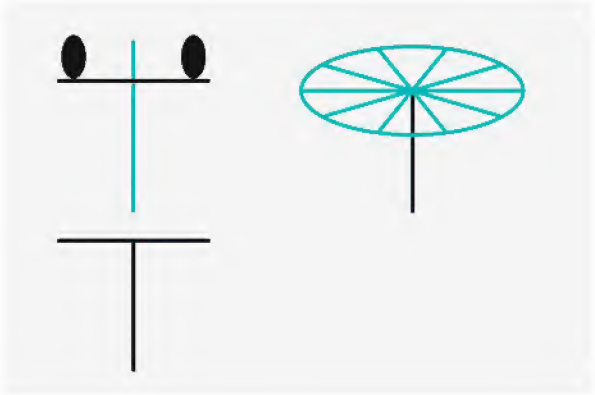
main & crossing axis

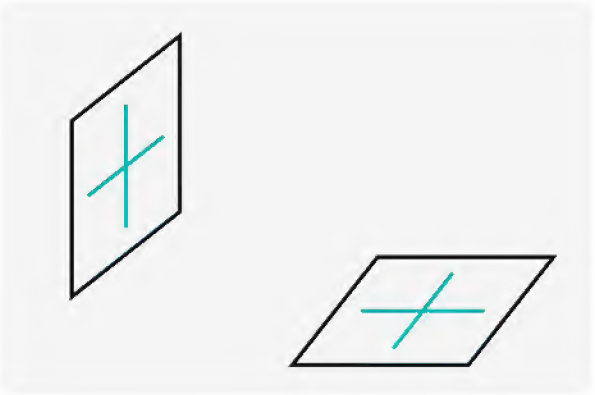
The repetition of point-elements at regular intervals produces an even rhythm dictated by object and interval. The path is divided into individual sequences that are perceived as small subunits. Each sequence is evaluated in terms of its distance from the destination, and the distance to the destination becomes measurable.

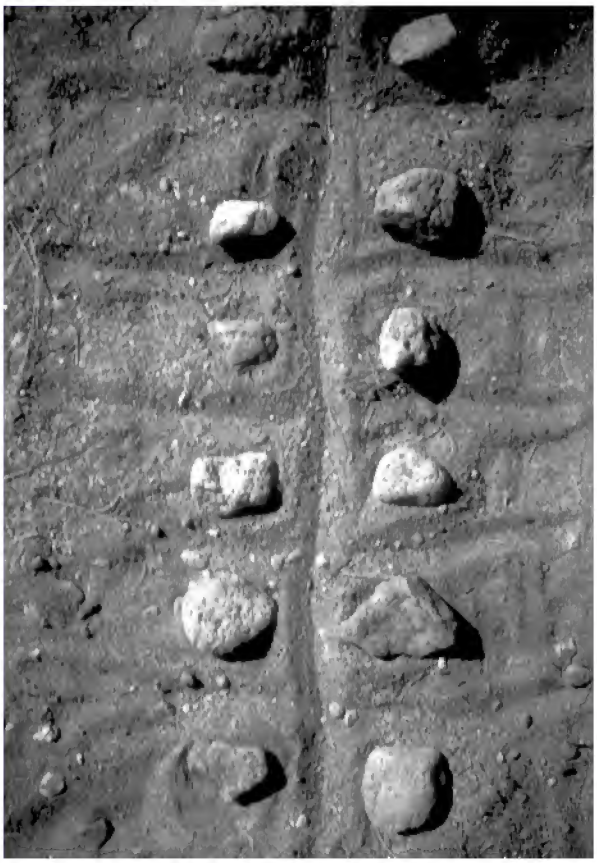
By mirroring these point-elements a ceremonial axis is produced. The orientation of the accompanying objects influences the overall effect.

Terrestrial power is demonstrated by Albert Speer in the avenue flanked by eagles mounted on high pedestals and orientated laterally in respect to the main axis. Glaring down at the oncoming pedestrian, these enormous eagles radiate a vigilant and intimidating mood that must be overcome step by step.

ceremonial axis







Directional Elements

The addition of point-elements can become so dense that the spaces in between seem to disappear. This produces the effect of a continuous line even though it is clear that the line is composed of individual elements. If the individual parts are **arranged sideways**, one behind the other like a line of people, their overall impression is one of a directional, dynamic line. There is no apparent beginning or end, and it suggests an arbitrary length that allows the random continuation and movement of the line.

If the individual elements are **arranged side by side** and face the viewer, the impression they give is one of a wall. Even if the individual elements are not densely aligned, their proximate relationship ties them together in a linear configuration along the village square – as with these rice storehouses in Sulawesi.

orientation

The **frontal assembly** of homogenous point-elements side by side can easily lead to monotony if there is no superordinate element articulating it. Color differentiation as used by Bruno Taut in his Horseshoe Development in Berlin may also provide such relief.

The perception of an assembly of homogeneous parts can be improved by giving the overall figure a curved form. This helps us to define and grasp an overall size and to contain the space at the front. The housing development on Crescent Park in London makes use of this effect by tying terraced houses together into an overall form that conveys the impression of an English palace complex.

side by side

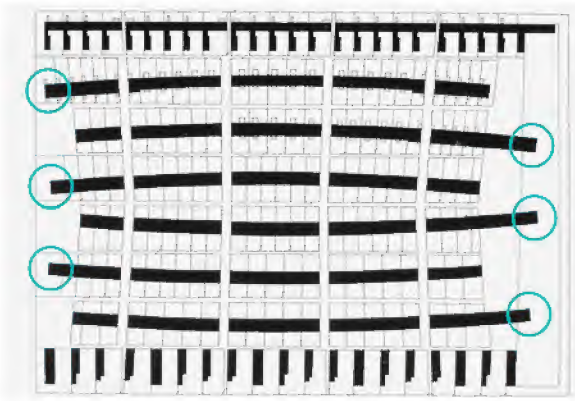
A curved arrangement suggests a part of a larger whole; our minds fill in the missing parts. This effect can be provoked even by a very slight curve, as can be seen, for example, in the Pilotengasse housing development in Vienna (architects Krischanitz, Steidle, Herzog & de Meuron). Dimension can be assessed at first glance. Between the parallel rows there is a curved intermediate space that doesn't simply "flow away" as it would if the rows were straight because it appears to be closed at the ends.
It seemed no longer possible to think of vision as proceeding from the particular to the general. On the contrary, it became evident that overall structural features are the primary data of perception […]. [Arnheim, Art and Visual Perception, 45]

one after another

Through the curving form of the mirrored rows of buildings a large green space was created in between. The effect of the resulting overall concave figure is stronger than the individual parts and determines the impression of the space. The intended effect of this open space, however, is weakened by the fenced-off front yards and the path leading down the middle.

The entire complex is seen typologically as a figure freely set in a meadow. The individual rows are staggered in respect to each other, so that the ends do not form a clearly defined edge but a cogged interface that fits into the surroundings. The end points of the rows that jut out farther are not merely chopped off but form communal gathering areas on the ground floors that step back from the ends and open out in all directions.

face to face



Line 3|3| Linear Volumes

Simple linear volumes are strongly directional buildings as opposed to point-element volumes, which are clearly centered. Through their clear orientation they determine the dynamics of the external space. This office and residential building in the form of a raised beam, by Eric Owen Moss in Culver City/Los Angeles, runs parallel to the street and fits into the existing dynamics of the public space. Through its elevated position it also underscores movement taking place **along** the linear form.

Duplicated linear volumes: The art museum in Kitakyushu in Japan, designed by Arata Isozaki, cantilevers out into the landscape with two lengthwise rectangular volumes. The main structure runs **along** the contour lines of the slope. The two rectangles assume a special role extending **laterally** in respect to the slope. In addition to their symbolic power, their position suggests a connection between point A and point B, which in this case is the connection between the museum on the hill and the city below.

Curved linear volumes: The O-Museum in Lida, Nagano Prefecture, by Kazuyo Sejima is designed in the form of a slender rectangular volume amid rural surroundings and raised high enough above the ground that the existing landscape is not interrupted and is allowed to flow freely beneath it. The linear volume seems to hover above the ground. Its slight curvature gives containment to the front entrance area.

The outer curving beams of the roof continue as two arch-shaped frames encircling the Miyagi Stadium designed by the architect Hitoshi Abe, and located near Sendai. These embrace both the playing field and the spectators. Functionally their sloped position is based upon by the stepped bleachers inside. The form of this seemingly natural arena creates a space that orientates the spectators' attention on the playing field.

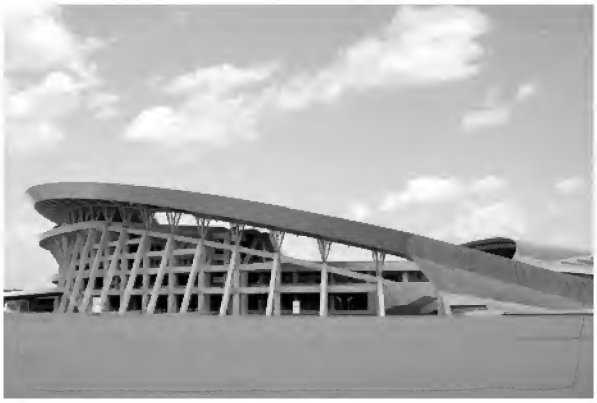
guiding space

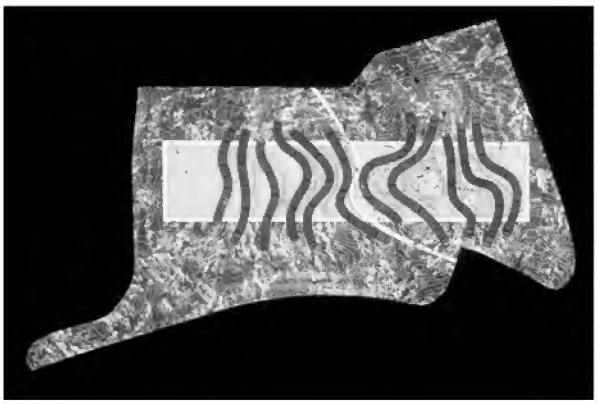
Addition of curved linear volumes: The photos of models for a school building in Noumèa by Francis Soler show snaking linear volumes arranged freely in respect to each other. The buildings themselves are set on pilotis in order to let the terrain flow beneath them and to produce shaded exterior spaces. The different degrees of curvature of the linear volumes create a variety of exterior spaces.

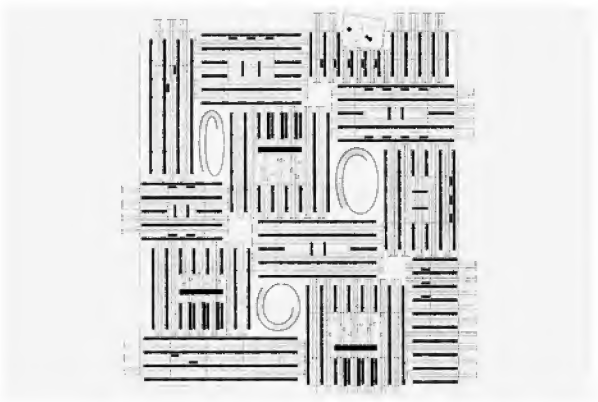
shaping space

Crossed linear volumes: In his design for the Swiss pavilion at the EXPO 2000 in Hannover Peter Zumthor stacked individual wooden planks into wall-volumes and arranged these units in a crisscross pattern to define spaces.

Overlapped curved linear volumes: The model shows Zaha Hadid's design for the National Museum of 21st Century Arts (MAXXI) in Rome. The bent and curved building volumes diverge from the course of pure linearity. Their overlapping suggests a focal point of the overall composition. In an age dominated by speed and mobility these linear building volumes correspond to current notions of space more accurately than to those of former times when clearly centered volumes expressed the need for stasis and permanence.







Plane

The plane extends two-dimensionally and thus differs from the dimensionless point and the one-dimensional line.
According to the thesis of this book, this extension in architecture takes place **horizontally**, affording humans the opportunity to move about or lie down on a plane. The horizontal plane is regarded as fundamental for all events and activities.
A plane can also define a specific area.
The plane stands in contrast to the point and to linear elements that extend in a vertical direction. It expresses **expansion**, **extension**, and **relaxation** as opposed to the concentration of the point or of the dynamics of the line.

plan

Plane 1| Plane and Area. The Planar Element Itself. On the Plane

To us humans, the surface of the planet is a two-dimensional plane that exists everywhere a priori.

Plane 1|1| Manifestations of Planar Elements

Natural

The largest planar extension on the surface of the earth is constituted by the oceans. Because of gravity, the water level of the oceans seems to be the same everywhere.
Sea level is commonly used as a point of reference for all elevations.

Artificial

Flat surfaces are not uncommon in nature, but a completely flat planar extension occurs less frequently. If there is no naturally occurring **flat surface**, great efforts are often made to level and cultivate one.

horizontal

Just as the line can arise through the movement of a point or through the addition and tension of several points, it is also possible to trace a planar element back to two fundamentally different processes: **filling** or **spreading** and **outlining**.

If a more or less homogeneous material forms a plane, we speak of **filling** or **covering**, like in a field. **Spreading** entails the application of an additional layer to an already existing basic plane, as in painting, in order to distinguish a certain area.

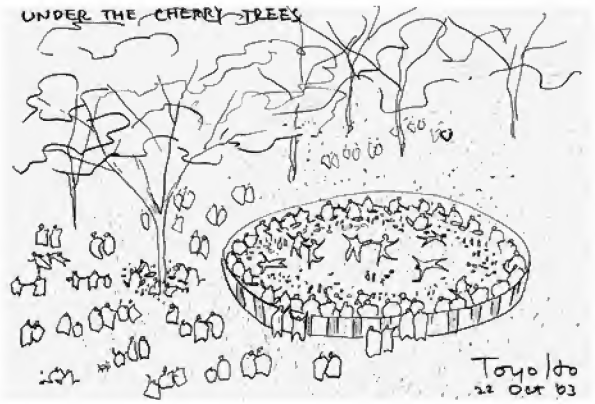
stepping onto

Outlining defines an **area excluded** from a continuous plane.

Outward and Inward Effect

Outlining defines a clear line of separation from the overall surrounding area. The line drawn around the area is perceived from within as an enclosure or “inclusion” but also as an exclusion of the exterior space or as a delimitation vis-à-vis the surrounding environment. One can settle down in this enclosed area. Failure to recognize the border is perceived as **stepping over** the line or trespassing.
As opposed to outlining, **spreading** is seen as the defining of an area as distinct from the surrounding environment. It is a marked area, an emphasized area on the ground, a place in which to spread out and relax. The edge of this area makes a less hermetic impression than the linear boundary, hence we speak of **stepping onto** rather than **stepping over**.

stepping over


UNDER THE CHERRY TREES
Toyo Ito
22 Oct 03

Plane 1|2| Outline

Tension within the Imagined or Drawn Outline

We can extend Kandinsky and Klee's thought processes to apply to types of plane formation:
Outlining consists of single points or lines.
[…] the straight line *and* the curved line *represent* the primary contrasting pair of lines. *[…] Whereas the straight line is a complete negation of the plane, the curved line carries within it a* seed of the plane. *If the two forces, with the conditions unchanged, roll the point even farther, the developing curve will sooner or later arrive again at its starting point. Beginning and end flow into each other and in the same instant disappear without a trace. The most unstable and, at the same time, the most stable of planes is created – the circle.* [PLP 81]
To form a plane with the use of straight lines at least two such lines are necessary.

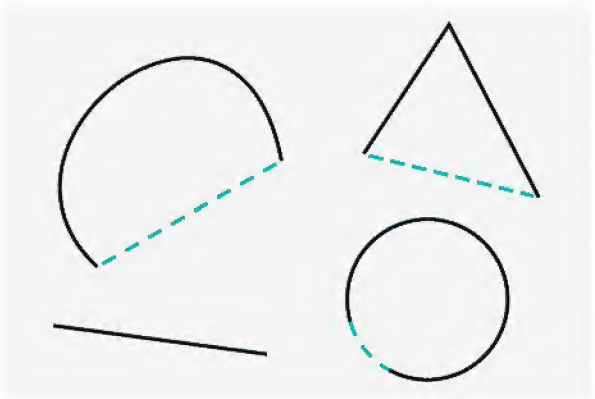
Just as a linear element arises from the imagined tension between two points, so too can the arising tension between two lines produce an imagined plane.
Even the straight line, in the final analysis, carries within it with its other characteristics the desire (even though deeply hidden) to give birth to a plane; to transform itself into a more compact, more self-contained thing. The straight line is capable of doing this, although, in contrast to the curved line, which can create a plane with two forces, it needs three impulses to form a plane. In the case of this new plane, beginning and end cannot completely disappear, but are observable at three points. [PLP 82]
At least three points are needed to suggest a plane. The plane is generated from the implied line that connects these points or an outline consisting of a single line. The simpler the geometric form, the more memorable the figure.

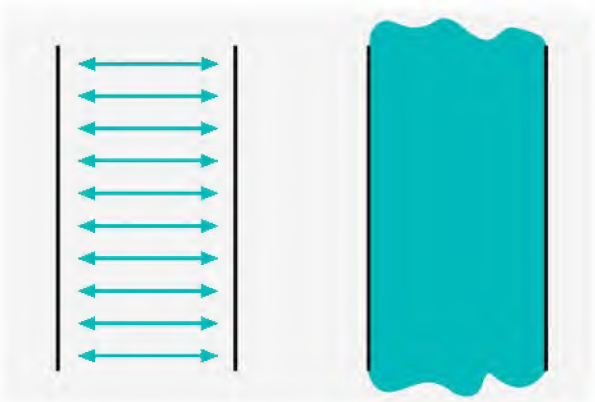
tension

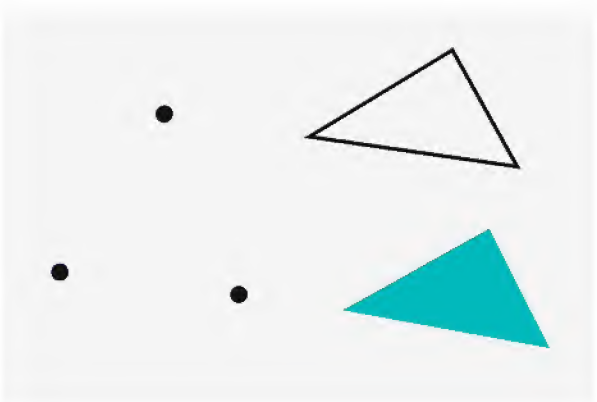
The more alternating forces there are acting on the point, the more diverse their directions. And the more different the individual segments of an angular line are in length, the more complex will be the planes created. The variations are inexhaustible. [PLP 84]
These explanations for the formation of planes help illustrate which dynamics come from the outlines and angles that give the **impulse for changes in direction**.
In principle, the enclosed forms are seen as figures if no other forms intervene. The figure generates a dynamics, like the forces used for the formation of boundaries and changes in direction. A circular plane is surrounded by an encircling dynamics and a field of tension in the form of a circular ring. In the drawing of the polygon, the forces run parallel to the edges and have a dynamics of repulsion at the corners.

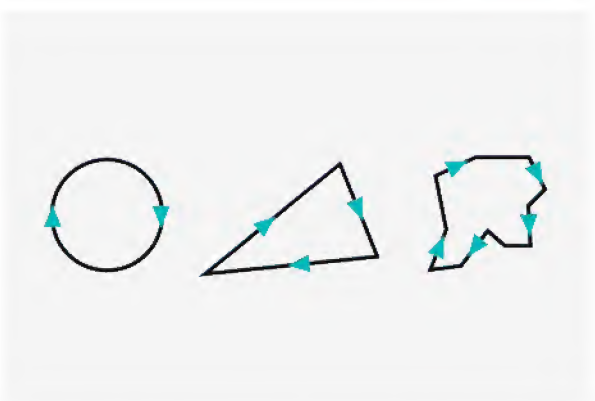
boundary dynamics

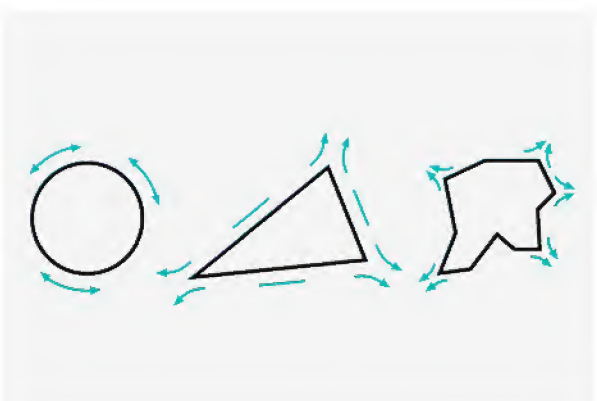
A curved line, with **uniform** forces acting on it will produce a **circle**. Beginning and end points meet. If the forces acting on it are **not uniform**, a **spiral** is produced; beginning and end points can continue infinitely. It is a hybrid form that always represents a line that seems to emanate from a point but which takes up the space of a circular plane in its extension, like the exterior space of the cultural center in Niigata by Itsuku Hasegawa. The spiral is a line that unrolls out of itself from a two-dimensional standpoint. It is an open, dynamic figure that refers beyond itself with each rotation. Seen from inside out, it gains expansion energy with each rotation. And seen from the outside looking in, it gains concentration. As a figure in repose it marks the path into the innermost center. The counterclockwise winding spiral as seen from the center is an inward rolling form that indicates a path back to its origin, to the womb, and also to death. The clockwise winding spiral represents an unrolling form, the opening up toward life and the future, toward evolution. From a three-dimensional perspective it can be seen in vortices. It manifests itself in snail shells, for example.

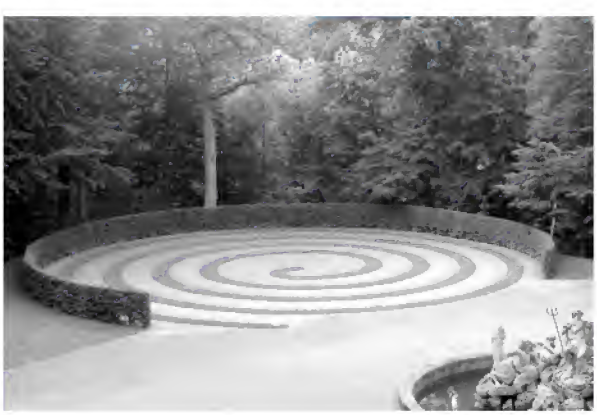












Plane 1|3| Spreading or Filling

Spreading covers an entire surface evenly or tries to give this impression without outlining.

Spreading is the opposite of **outlining**. It does not consist of individual points or lines. In his book "The Thinking Eye" Paul Klee traces the genesis of the plane back to the act of spreading. He describes this as the notion of a line being pushed like a squeegee and spreading printer's ink across the page. This always produces a rectangle that has the width of the squeegee, or the length of the line.

Filling a surface can also be achieved using individual elements.

filling

Spreading can be expressed in ornamentation. The Piazza del Campodoglio's entire surface is covered by uniform paving stones after the design by Michelangelo. Lines in the paving demonstrate a pattern of outward energy that seems to emanate from the equestrian statue at the center. The surrounding buildings, against which these energy lines ripple and are deflected, help to express the plane of the plaza.

plaza and plane

When the extension of the plane is very large in relation to its bordering elements the inner tension and the relationship of the border to the center are no longer perceptible. An individual feels lost and disoriented on the plaza. The vast Tiananmen Square in Beijing tends in its conception to serve as a rally grounds for military drills and parades with plenty of room to move about in. It is less apt to function as a place for individuals to stop and linger.

dynamics of the figure

When an area is outlined, the dynamics of the perimeter make the edges and the corners dominant. Filling emphasizes the expansion and extension of the flat surface area itself.

The outward appearance of a simple geometric figure as a whole is easily seen and understood at a glance.

Forces spread evenly from the center to the edge in regular centered figures, while tension along its edges contains or holds the surface.

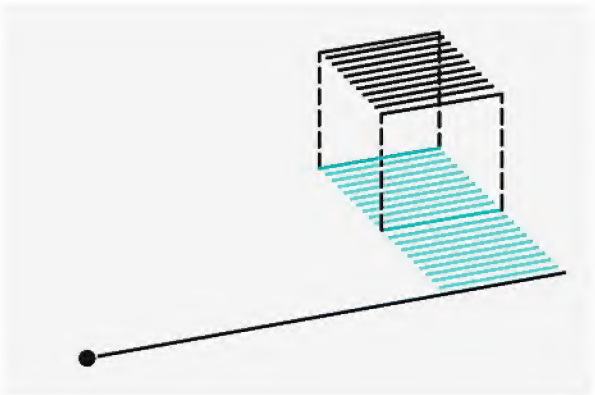
The longer side marks the dominant direction in directional figures and a longitudinal field of energy is generated. The shorter side is perceived as a transverse direction. The effect of a surface is also influenced by the standpoint of the viewer, who perceives the surface and its overall form in relation to himself.

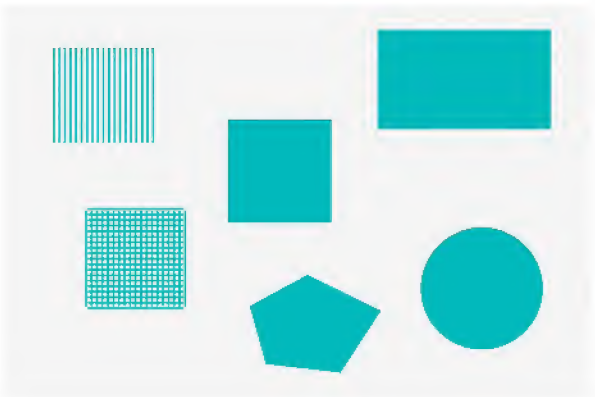
There are various possibilities for filling a surface:
the full-surface, homogeneous filling
the addition of point-elements
the addition of linear elements in different arrangements: radial, branched, chaotic (orderless), parallel, crisscrossed.

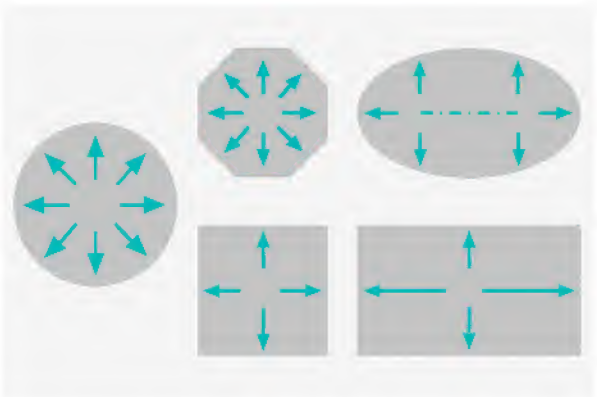
Full-Surface, Homogeneous Filling

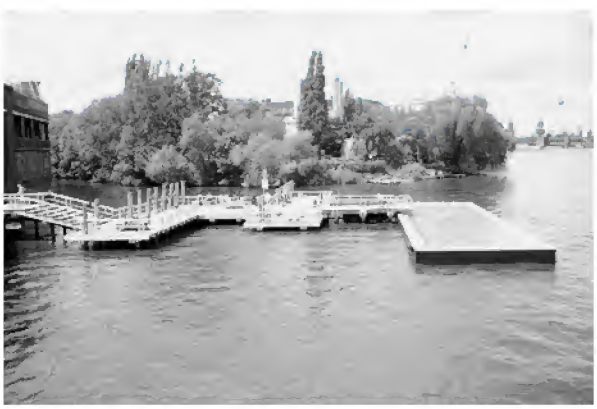
Full-surface fillings consisting of a uniform material are seamless and leave no spaces. They are usually applied in liquid form and solidify into a homogeneous surface.

A horizontal plateau is prepared for the sumo ring in the temple district of the Suwa Shrine. The circular area for the wrestling matches is marked off by a rope and made firm using a mixture of water and sand.









Addition of Point-Elements

The installation “Bed of Spikes” by the American artist Walter de Maria clearly illustrates how dependent various perceptions, sensations, and interpretations are on single elements and the distance between them.
Thus in the first picture, the spikes have been placed in the middle as individual elements and are perceived as such.

In the second picture, we recognize the single elements arranged in rows.

effect of single elements

The third picture oscillates between giving the impression of a plane or of rows. The primary longitudinal axis of the rectangle influences our perception. Although the distance between the spikes in the five rows seem to be the same as the distance between the rows themselves, we still perceive five rows.

It isn’t until the fourth picture that the distribution seems evenly dense. The individual spikes’ fields of tension could touch each other. The arrangement appears dense enough to achieve a potentially surface-covering, and thus surface-like, impression.

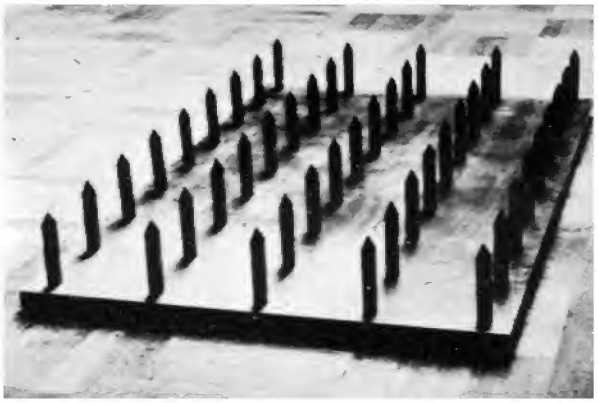
effect of the whole

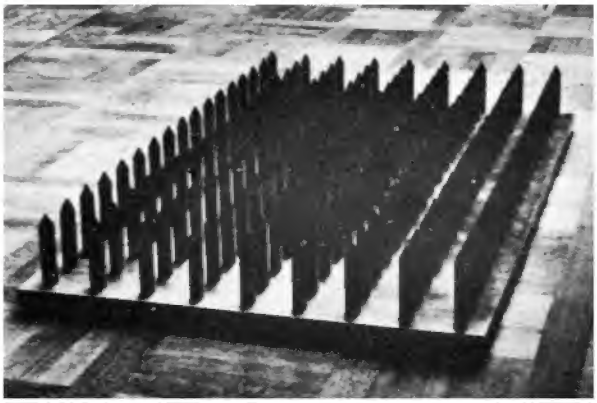
Addition of Linear Elements in Various Arrangements

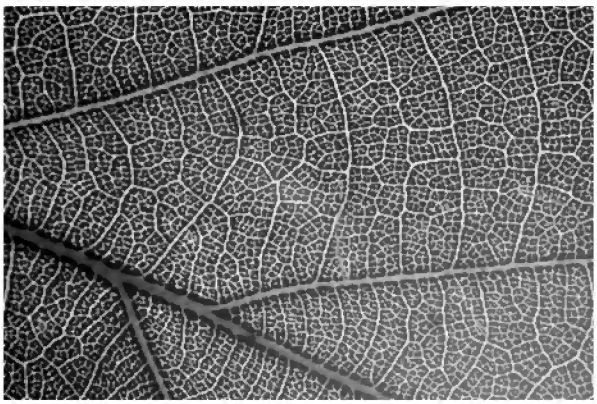
Radial – each line diverges from a center
Branching – like the structure of a tree from the trunk to its boughs or the veins of a leaf

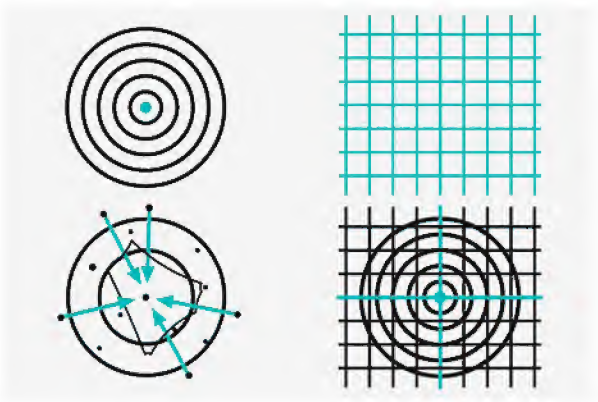
Organic line complexes create systems of supply or support between which the surface tissue grows, as is commonly seen in the tissue of a leaf or the supporting structure of skin.
The principle of the main and subordinate systems of supply and disposal, of branching and ramification, works in much the same way.
Humans have taken advantage of a number of different ways for transforming linear elements into planes. Similar supporting structures for surfaces provide the basis for an organic vocabulary of form in architecture.

Combining centered and linear principles brings two fundamental ordering systems together: the **cosmic principle** that develops around a center, from a center, from a cell, or around a solar system, and the **Cartesian principle** that consists of a vertical and horizontal network structure. The latter notion derives from the lines of gravity, which point to the center of the earth and only seem parallel to humans due to the size of our planet.
The abstract vertical/horizontal system of reference points is non-hierarchic and has no center. To designate place René Descartes had to define a point zero as the origin of the coordinate system. This is effectively a combination of both principles.









Chaotic (orderless) – Linear elements like these thick pieces of slate in an installation by Richard Long at the Museum Hamburger Bahnhof in Berlin express no preferred direction nor do they establish a center. The individual parts comprising the circle seem to go off in random directions and give only a diffuse notion of the center. The nature of this arrangement emphasizes the circular figure's dynamics of planar expansion more strongly than its centering.

expansion

Parallel – The application of lines occurs frequently in nature. Kandinsky sees in nature's laws of composition not only the possibility of imitating outward appearances but also the possibility of juxtaposing these laws of nature with those of art, i.e. *the law of setting side-by-side or setting opposite (the principle of the parallel and the principle of contrast) […]* [PLP 103]

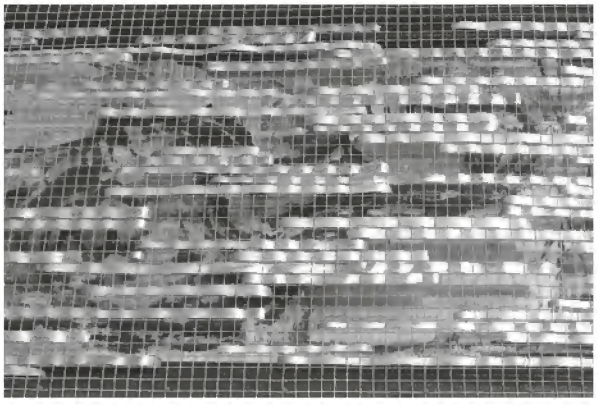
All area-filling contributions up to this point, including the ordered parallels, require a physical support. Composing them makes them recognizable as a visual plane but not as one that is self-supporting. Plant and animal fibers also require a supporting surface as their base until they are processed into a sheet of paper or felt. In nature, fibers can also be connected by intermediate elements to form a plane, like a palm leaf, or hooked together like a feather. Along the fibers it is easy to separate the materials, but perpendicular to the fibers the planes resist.

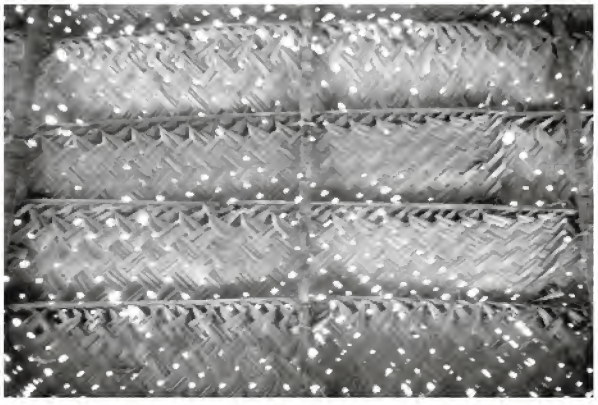
Crisscrossed – As opposed to parallel planes, crisscrossed and woven planes are artificial arrangements of the line. Humans have taken advantage of these in many ways, especially in weaving in the form of cloth, textiles, basketwork, mats, etc.
Warp threads arranged parallel to each other make up the supporting structure through which the perpendicular weft threads are interlaced. From the same threads a weave is produced that results in a homogeneous texture of a harmonious homogeneous textile surface. Linear structures emerge in a textile surface if the warp and weft threads are made of different materials. From the parallel, purely flat arrangement we take a step to a new – spatial – level: the production conditions and formal intentions give rise to various patterns.

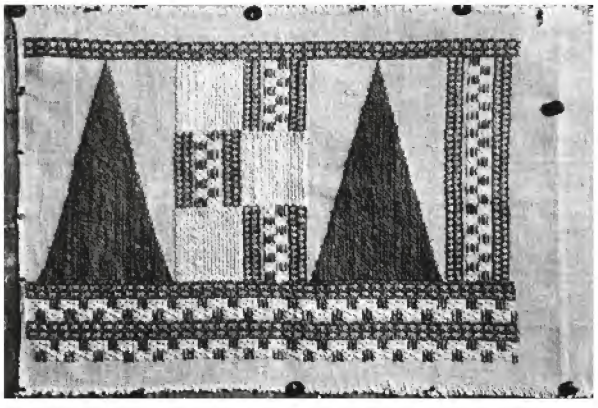
weave

In this way the design options of a woven carpet (kelim) are governed by certain specifications and clearly differ from the production conditions of a knotted carpet, which is based on an existing mesh canvas. The texture provides clear information about the materials and method of production. Plant fibers can be processed in a similar way to make mats.
The word **texture** has several senses. Literally it means weave, network or fabric. It also signifies the spatial arrangement and distribution of the component particles of crystals in geology, the nonrandom orientation of a material's individual crystallites in materials science, and the structural alteration of a material's fabric during cold forming. In an architectural context it generally means the quality of the surface. In urban planning it denotes the composition and arrangement of the building structures and the dimension of the components.

texture







Plane1|4| Basic Plane

Different processes are used to **cover entire surfaces** in the printing industry: thus in a woodcut (l.) the printing surface stays, everything else is removed. In an **etching** (r.) the needle serves as a tool for producing points and lines. The addition of lines results in planes, hatching, etc. *In etching, naturally, the smallest black point can be obtained with the greatest of ease while, on the other hand, only with considerable effort and various tricks can a large white point be obtained. […]. It remains to be mentioned that the three techniques […] are related to social forms. The etching […] can produce only a few good prints and they turn out differently each time, so that every print is unique. The woodcut is more abundant and uniform […]. The lithograph, on the other hand, is able to yield an almost limitless number of prints with the greatest rapidity in a purely mechanical way and […] approaches the hand-painted picture. At any rate, it produces a certain substitute for the picture. The democratic nature of lithography is hereby clearly indicated.* [PLP 46, 112]

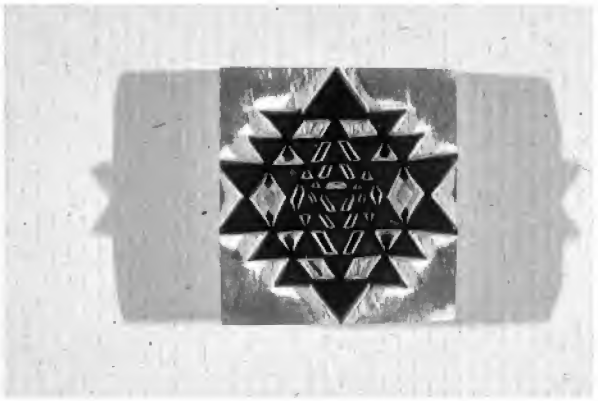
Plane 1|4|1| Basic Plane in Painting

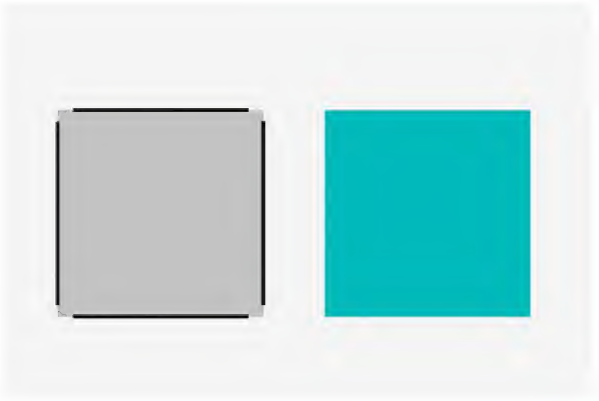
The term Basic Plane [BP] *means the material plane which is called upon to receive the content of the work of art.* [PLP 115] According to Kandinsky, the schematic BP is set off as an individual thing in relation to its surroundings by two horizontal (cold) and two vertical (warm) bounding lines. Thus two elements of cold rest and two elements of warm rest produce two double-sounds of rest, which determine the objective sound of the BP. If one or the other pair predominates, this indicates the coldness or the warmth of the objective sound. The **predominance of the cold** corresponds to the **landscape format** and the **predominance of the warm** to the **portrait format**. Kandinsky's studies apply originally to painting, where the BP usually hangs on the wall. However, they can also pertain to architecture, where the BP represents a horizontal plane on which we go about our activities. It is on this BP that architectural planning takes place. And it is here that the forms of the basic elements and their forces, which we are analyzing here, can be recognized most readily.

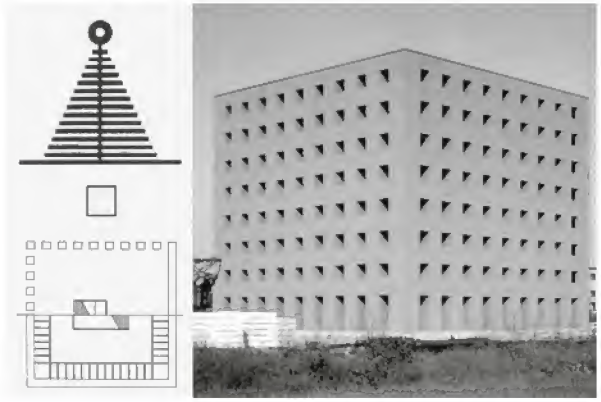
The most objective form of the schematic BP is the **square** *– both pairs of boundary lines possess an equally strong sound. Coldness and warmth are relatively balanced. A combination of this most objective BP with a single element which also carries in it the greatest objectivity has, as a result, a coldness similar to death: it can serve as the symbol of death.* [PLP 115] – Aldo Rossi chooses the shape of the square for his memorial at the Modena Cemetery 1971.

The individual sides and directions of a **rectangular BP** differ in quality. By taking these physical conditions into account, Kandinsky sets every living being in constant relation to the "above" and the "below". The awareness of this and the feeling associated with it are passed on to the sides of the BP. *The "above" gives the impression of a great looseness, a feeling of lightness, of emancipation and, finally, of freedom. […] "Freedom" produces the impression of a lighter "movement", and here tension can play itself out more easily. "Climbing" or "falling" gains in intensity.* Restraint is reduced to a minimum *[…].* [PLP 117]

In reference to architecture, we may imagine diagrams of a building in section.
Once again the **ratio of length to width** should not be seen merely as a ratio of scale; rather, it also possesses gestural expression as a **standing**, **lying**, **or resting structure**. Every other figure within the surrounding plane takes on gestural content too. *Every weightier form thereby grows heavier in this upper position of the BP. The note of heaviness takes on a stronger sound.* [PLP 117]. This corresponds to the experiences of tectonics in architecture. *The effect of "below" is the complete opposite: density, weight, constraint. The closer one approaches the lower border of the BP, the denser the atmosphere becomes; the smallest individual areas lie nearer and nearer together and in this way support the larger and heavier forms with increasing ease. These forms lose weight and the note of heaviness decreases in sound. "Climbing" becomes more difficult – the forms seem to tear themselves loose by force, so that the rasp of friction can almost be heard. A straining upwards and arrested "falling" downwards. Freedom of movement becomes more and more limited.* Restraint reaches its maximum *[…]* [PLP 117], like a stone block on the ground.







The following considerations could apply to both plan and section: *The position of the two vertical boundary lines is right and left. The inner sound of these tensions, which are related in our imagination to ascent, is determined by warm rest. […] The* "left" *of the BP produces the effect of great looseness, a feeling of lightness, of emancipation and, finally, of freedom. […] Just as the "left" of the BP is inwardly related to "above", the* "right" *in a way is the continuation of "below" – a continuation with the same weakening. Condensation, heaviness and constraint decrease but, nevertheless, the tensions meet with a resistance which is greater, compacter and harder than the resistance of "left". […] The one to the "left" – going outside – is movement* into the distance. *[…] The one to the "right" – centered inwardly – is a movement* toward home. *This movement is combined with a certain fatigue, and its goal is rest. […]* [PLP 119–121] These assumptions apply above all in the European cultural realm and are influenced by the reading direction. El Lissitzky used the dynamics of "going into the distance" as a symbol of setting out demonstrated here in a model based on the design for the Lenin Tribune 1919–21.

Plane 1|4|2| The Base Plane in Architecture

When we speak of a plane, we mean the idealized notion of a horizontal and even surface. In architecture the general conception of a horizontal floor plane is a surface for movement and rest that accommodates all events and activities. Gravity makes this our main plane of operation – as opposed to the weightless state of a space capsule or Max Peintner's vision of multiple uses for slanted water surfaces.

The **universal base plane** in architecture acts as a surface for the placement of objects. It is analogous to the basic surface in painting, which forms the base for the work. Departing from the horizontal spread of a water surface, Descartes constructed an orthogonal system of reference in geometry. It is a representational aid for spatial orientation, to which he adds a third dimension – the vertical. That corresponds to the upright walking human, man's physiognomy or figure.

horizontal

The base plane as a defined planar element is the precondition for architectonic space. The **floor plan** is the representation of a building that shows the **figure of the base planes.**

The floor plan (also) corresponds to the intention of this book because it is the only way to depict the dynamics generated by the formal elements. In the floor plan not only do the functional and organizational connections become visible but also their influence on the spatial composition and the sequence of movements.

This representational form, however, is not enough to depict a spatial object. As the figure of a sphere demonstrates, different results are produced depending on the selected section. In a regular form, like a circle, the centeredness of the point-element always remains the same, but one still needs a sectional or axonometric depiction to ensure correct spatial imaging.

base plane

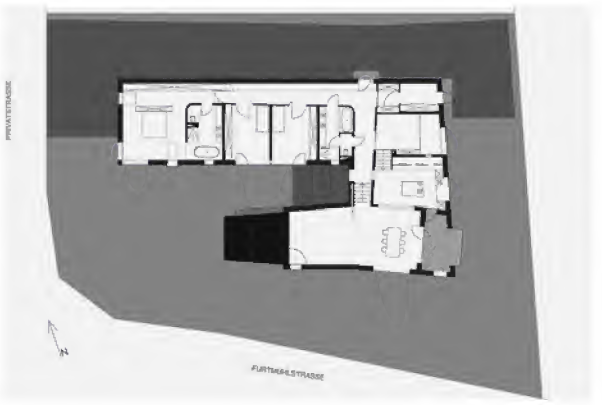
Level planes make it easier to carry out everyday activities and let water seep into the ground instead of flowing away too quickly. Since level horizontal planes occur rarely in nature, they must be artificially created and require effort. Agriculture uses terraced landscapes to make better use of irrigation and counteract erosion. Certain work areas like threshing floors have been used between harvests for dances and other festivities.

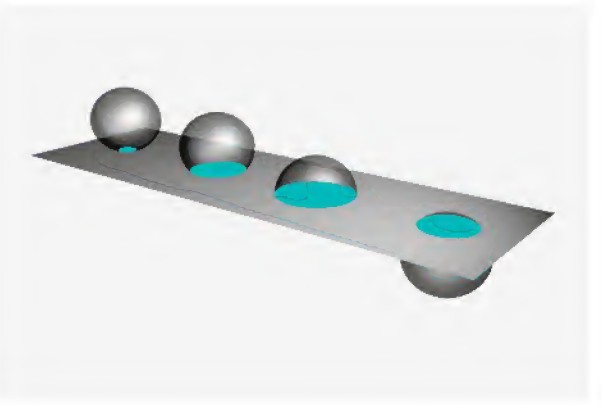
plane of operation

Heaven

Distance Home

Earth





Plane 1|5| The Phenomenon of the Plane

Plane comes from the Latin word *planus* meaning **level** and in reference to humans corresponds to the recumbent body. In the recumbent state the entire body is supported by the Earth. Muscle tone relaxes and the weight of the body is distributed across the contact area. This is a passive state that allows relaxation and excludes dynamics.
The detail of a painting by Anselm Kiefer ("Sternbild", 1996) shows a lying figure whose gaze is directed not at the horizon, as is the case in a standing figure, but straight up into the distance of the star-filled celestial plane. The view from the lying position corresponds to the vertical visual axis between the sky and the earth, as opposed to a horizontal visual axis parallel to the Earth's surface as an earthly orientation.

lying

In her book "Formen" [Forms] Ingrid Riedel compares the horizontal plane with a kind of stage of life upon which all elements, landscapes, and figures are equally important.

The horizontal is associated with everyday life and the ordinary, upon which things and events are lined up side by side. It is flattening, anti-hierarchical even to the extent of uniform sameness. The vertical, by contrast, expresses a high sense of values. It orders the values like a ladder and creates hierarchies.

The plane invites long-term occupation, as opposed to the linear element, whose main properties are dynamics and transfer.

staying

The covering element marks a particular **area**. Internally it distinguishes itself from its surroundings. The smaller and clearer the planar figure is, the more likely it is to be recognized. Even a simple blanket is accepted as a defined territory. For a limited duration this small plane becomes a special area separated from the flow of everyday life. Internally, the plane is experienced in Heidegger's sense of a calmed secure area (Befriedung).
Thus a person sleeping on the ground feels not only physically but also psychologically more protected if he is lying not on the bare ground but on a blanket.

calming

Identifying an area by means of outlining is perceived differently than filling in, covering, or painting over the same area. Point-elements or linear elements mark the edges, but the ground plane within remains unchanged. This accentuates the area, **upgrading** it in respect to its surroundings. A threshold along the border zone is created if the border areas are marked by point-elements. Depending on the orientation of those elements, the border has a filtering or a separating effect. [See chap. Point 3|1| Linear Arrangement. Row]

The circular arrangement of the directional chairs in the installation "Parliament" by Anatol Herzfeld (Museum Island Hombroich) gives the impression of a filter toward the outside and focuses attention on the empty center.

In a school yard these loosely scattered busts on rectangular pedestals lack density and orientation and thus fail to clearly mark off a distinct area.

marking off

Plane 2| Figure and Ground. The Planar Element and its Surroundings

As demonstrated in previous examples, a planar element can assume different forms to define specific areas.
We perceive areas and planar contexts depending on their scale and straightforwardness. What is important in all cases is their differentiation or distinction from their surroundings.

differentiation

This differentiation can be a stone slab lying on smoothed earth or wood floating like a raft in the water. In other words, it can involve various surfaces or materials (covering or filling). Plane definition can also be achieved either by a combination of covering or filling and circumscription (outlining) or by circumscription alone. Level variations may also differentiate a plane from the base or the horizontal.

An observer perceives a plane mainly via **visual information**, a user, however, via **tactile and acoustic information** as well.

form

Plane 2|1| Visual Perception of Planar Elements

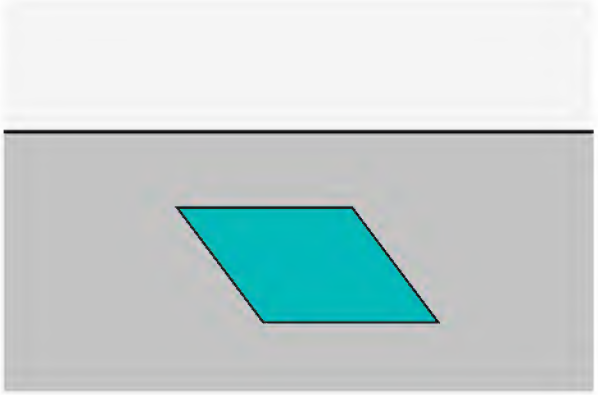
For a planar area to be recognized as such its size must be visually apprehensible. The form of the plane is either distinguished via its uniform covering or a clearly drawn outline.
If the form is visually apprehensible and memorable, it is referred to by Rudolf Arnheim as a “figure”. According to his definition, enclosed forms are seen as figures if no other factors intervene. **Regular forms** possess a high degree of predictability and can be easily **completed in our imaginations**, even if they are incomplete.
In his “Méthode de composition ornementale” Eugène Grasset derives all elementary ornaments, planes, and volumes from a basic pool of simple geometrical figures.
Irregular forms generate associations. Every person compares them to familiar figures based on individual experience.

figure

The forms or figures of planar elements have inner tensions that generate forces similar to point-elements such as **centered and non-directional**, **slightly directional**, **directional**, **amorphous** – or **linear**.

I will again refer to Kandinsky: *Complete absence of the straight and the angular on the one hand and, on the other hand, three straight lines with three angles – these are the signs of the two primary planes which stand in the greatest contrast to each other. Therefore, these two planes confront each other as the primary contrasting pair of planes.* [PLP 82]
While the dynamic effect in the triangle manifests itself at the three corner points, the circle demonstrates the highest degree of outward uniformity and closure with no possible means of approach. Its inward impression suggests extreme concentration.

circle and triangle

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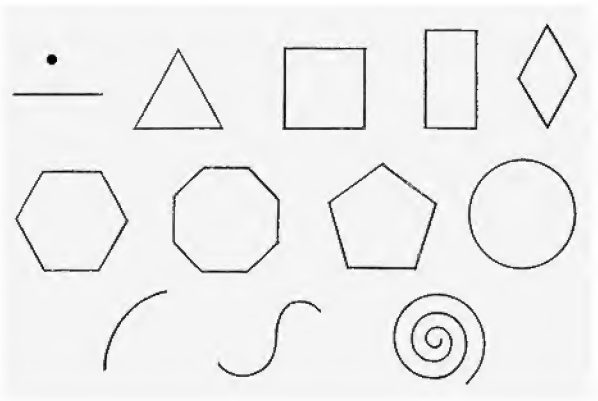
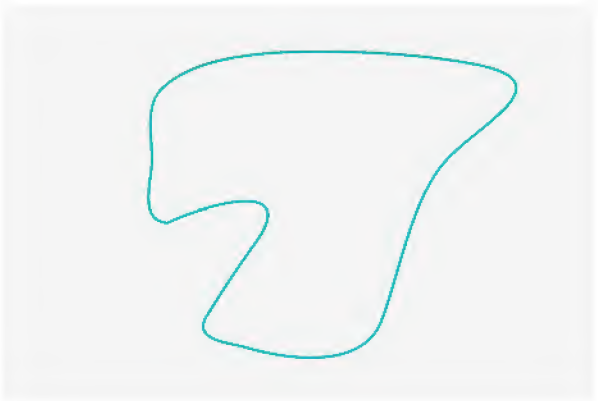
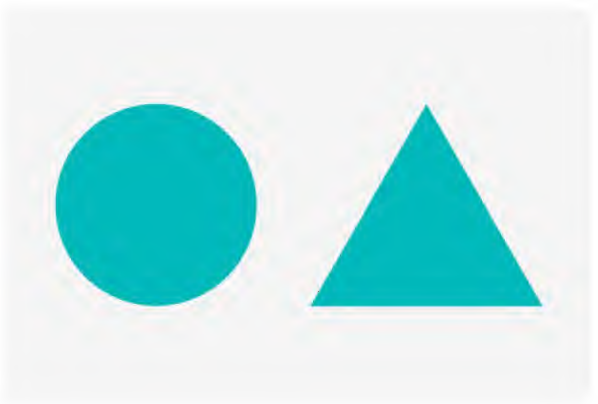
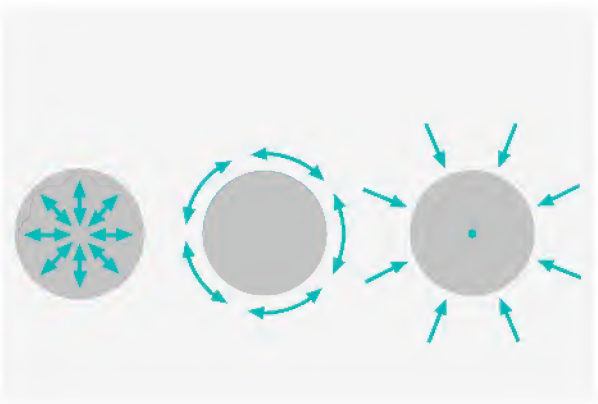








Centered and Non-Directional Planar Elements

A plane or figure that shows no preferred direction and whose outline approaches a circular form can be considered centered. This applies to the circle, the regular polygon, and forms that are rounded and irregular but centered.

The Phenomenon of the Circle

The perfect self-contained form is the circle. All rays or vectors emanating from the middle are always thrown back to the middle in a circular figure. The circle's center is charged with meaning. This is why the middle of a circular area, as in the city of Palmanova, is particularly well suited for a special eye-catching element such as a monument. One must wander off to the periphery to find relaxed zones for sitting or strolling.

circular form

In the circle, the center point and the balance point coincide. Even if the middle is left empty, one still senses the center. Through its absolute form, the circle gives an aloof, self-sufficient, and closed impression. It offers no point of interaction, but clearly defines a center. It is **extensible**, but offers no possibility of approach.
The house of the Mexican sculptor Orozco possesses these qualities.

Throughout the history of mankind, the circular form has always held special significance. From the beginning, the sun has influenced the rhythm of human life through its rising and setting. This glowing, circular disc meant light and warmth and its form was associated with the notion of origin and life. It is considered a symbol of **life**. The circle makes reference to the middle, center, cell, microcosm, and macrocosm. The circle is also a symbol that embodies the primal state prior to **creation** and to the Creator himself.

cosmos

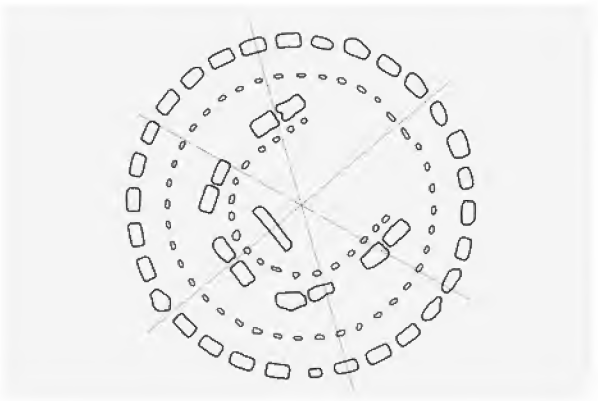
In ancient times, man pictured Earth as a round disc and transferred the meaning of the circle to Mother Earth.

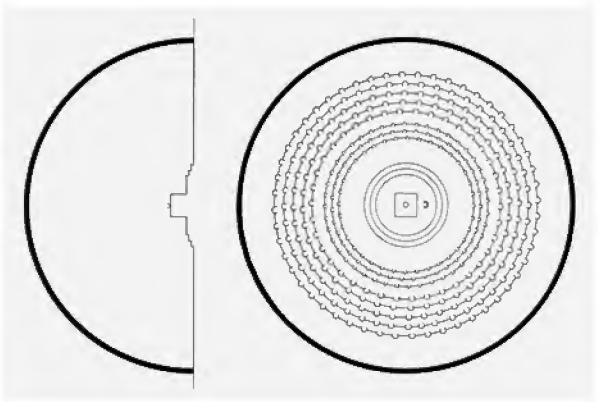
One of the world's oldest circular sites is Stonehenge, constructed in the 17th century B.C. The outer circular ring is built of rectangular stone stelae. Because of their orientation, they act like a boundary wall against the surrounding area. The next ring consists of rounded stelae encircling the center of the complex and forms an inner filter. Within the inner circle are the so-called trilithons. They correlate to certain solar constellations. In his "History of Religious Ideas", Mircea Eliade discusses stone from a mythological perspective, describing its meaning as the symbol of a yearning for stability, constancy, and immortality. Stonehenge is interpreted as a cult site due to its circular form, the relations of its axes to certain solar incidences, and the selection of a durable material.

cult area

The circular form in its architectonic manifestation is reserved for **special buildings** that have some relation to human life, like the baptistery in Pisa or the Temple of Heaven in Peking (round and octagonal). [See chap. Point 1|3|1| Non-Directional Point-Elements]
The circular form means community and belonging from a sociological perspective. This is examined by Rudolf Schwarz in his book "Vom Bau der Kirche" [The Church Incarnate]. The area within a circle is given particular attention in cult rituals, dances, and other such activities. The attention of all observers along the perimeter of the circle is drawn to anyone who steps into this area because the forces and tensions increase in the form of concentric rings and reach their greatest concentration at the center. Occupying this center area means accepting attention and – as a result – the strongest position of power. The convex form when seen from outside the circle appears to rebuff and signifies exclusion to all "outsiders".

community





Slightly Directional Planar Elements. The Phenomenon of the Square

Here, four equally long sides are fixed at right angles in respect to each other and define four equally important directions. While a circle has an unlimited number of symmetrical axes, a square has only four. Unlike in the case of the circle, vectors radiating from the center are only reflected back to the center at four points, and so the inner dynamics of the form does not seem manifold but set, permanent, and unalterable.

According to the French author Gérard de Champeaux, the center and circle as well as the cross and square constitute the four elementary symbols. The square is the symbol of the Earth as opposed to the heavens while on another level it stands for the created universe as opposed to the uncreated and the Creator. The form of the square stands for **the earthly** and thus forms the **antithesis** of **the transcendental**. The square also symbolizes stagnation and earthly death. [See chap. Plane 1|4|1| Basic Plane in Painting]

square

The **square** emphasizes **finiteness** – as opposed to the circle whose line has no beginning and no end. Martin Heidegger speaks of the **"Geviert"**, of the marking off and excluding of our own primordial space from its surroundings. This Geviert also becomes the holy space or place that no unbidden person may enter. The figure is so distinct that the observer completes it even if the boundary fails to fully outline the area. Holy fields are often based on the symbol of the square, which follows the rules of a vertical-horizontal structural system and thus seems to offer special protection against chaos. Volumes such as cubes and pyramids erected over a square are architectural **archetypes**. [See chap. Space 1|3|3| Centered Ceiling] In a pyramid the square as the base plane represents the manifestation of the earthly, while the central vertical axis alludes to the connection with the hereafter. The pharaoh as a godlike ruler seeks a connection with the heavens. The mummified body placed in a pyramid ensures permanence in an earthly sense, whereas the soul is oriented towards a possible hereafter. [See chap. Point 1|3|2| Special Form – The Square]

earthly perfection

Another example of a slightly directional plane is the circle-like elliptical form. It **connects centeredness and orientation** especially well in inhomogeneous surroundings such as the oval area in the Tartini Square in Piran, designed by Boris Podrecca. The paving and edge design make the geometrical figure visually recognizable. A slight bulging up of the oval area adds to the tactile feel of the shape. A monument as a point-element in one of the two foci fixes the square in the urban fabric. The other focal point is left unoccupied.

Directional Planar Elements

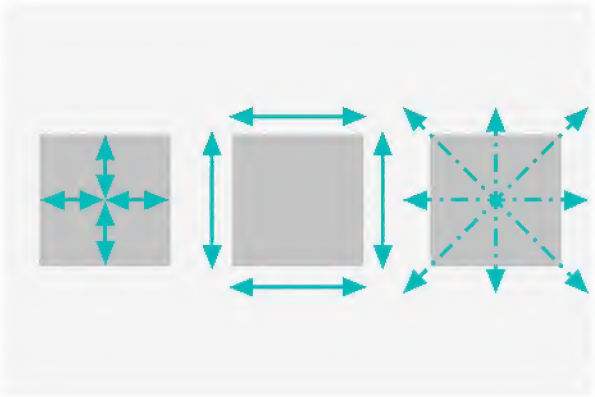
Depending on the length-to-width ratio, the ellipse is either dominated by a uniform dynamics around the center or a clear orientation. Directional planes like the rectangle and ellipse produce a **symmetry around** a **central axis**. This becomes the main direction and also governs the dynamics of the plaza area. In addition, a **central** and two **lateral zones** are created.

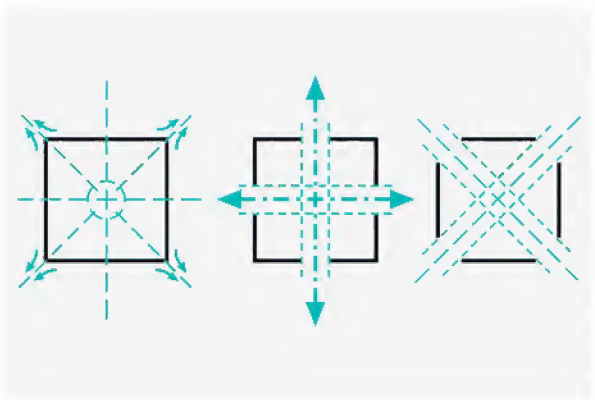
ellipse

The size of the plaza, the degree of closure, the recognizability of the figure, and whether the center is occupied or kept a void are some of the criteria explored by Camillo Sitte: *We can take the simple building height as the minimum for the appropriate dimension of the plaza. For a positive effect, however, the maximum should not exceed twice that height.* [Der Städtebau, 51]

Point-elements constituting a boundary need to stand close together in order to define the open areas. Linear and closed boundaries have a much more powerful effect. Plaza spaces are most clearly recognizable if they are surrounded by buildings as are the Piazza San Marco and Piazetta in Venice. The Piazza and the Piazetta are perpendicularly aligned with the campanile marking the intersection. The ground-level zone is delimited by rows of columns and arcades. It is not hermetically closed off but, via the covered circulation zones running around the perimeter, forms permeable borders between the urban spaces and the municipal administration offices.

alignment





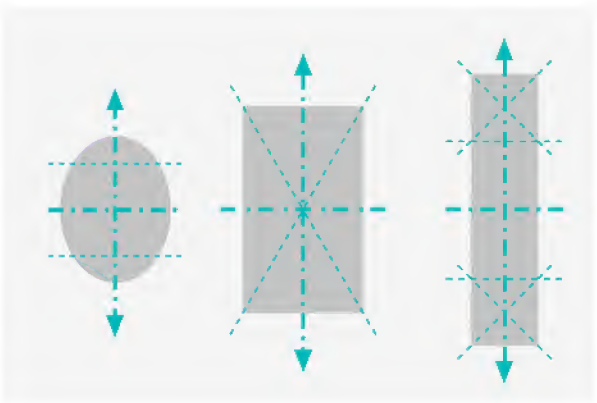


Figure and Ground

Throughout history artists and architects from Kandinsky to Arnheim, from Schwitters to Eisenman have been interested in the perception of "figure and ground". Investigations of this subject have concentrated for the most part on the simplest case of a figure-ground relationship in which the ground appears to be endless and shapeless. If several planes overlap, conflict between figure and ground may arise.

If a single black circle lies on an undefined or potentially delimited ground, only one relationship between the two planes is considered relevant: the object the observer is looking at is in the **foreground (figure)**, the other object is in the **background (ground)**. In the first example, a black circle lies on a white square ground. In the second case the figure is a black plane on an endless light-colored ground, or perhaps it is a (light-colored) hole in the middle of the plane. In all four cases the balance point or center point of the figure and ground coincide. They are completely at rest. [See chap. Point 2|1|1| Single-Sound]

figure and ground

The center can be determined by geometrical, mechanical, or empirical means. The balance of a free form can be found using plumbs affixed to different points near the edge. If one balances a free form on one's fingertip, one feels the distribution of weight and can empirically determine the point of balance. This awareness is kinesthetic, i.e. it is based on muscle-sensory perception.

Such tension sensations also guide us in our visual perception, as Rudolf Arnheim claims in his book "The Dynamics of Architectural Form". These sensations help us recognize when a point is shifted from the middle of a plane and the balance points of both figures no longer coincide. We perceive areas of differing density in the surrounding square plane.

balance

Narrow before Wide

If two objects bordering on an intermediate space depend on each other as complementary halves, the intermediate space is more vibrantly and densely filled than if the forms are complete in themselves and largely independent. Emptiness, therefore, is not merely the absence of matter, but it is dependent on the fields of tension created by the surrounding objects such as convex and concave forms.

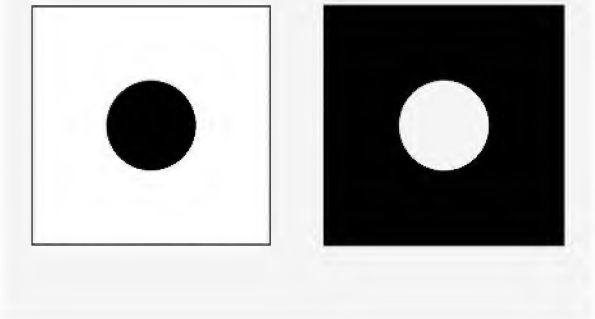
As the distance between planes grows larger, **the density of the intermediate space** decreases and finally disappears completely. Rudolf Arnheim elaborates this in his publication "The Power of the Center".

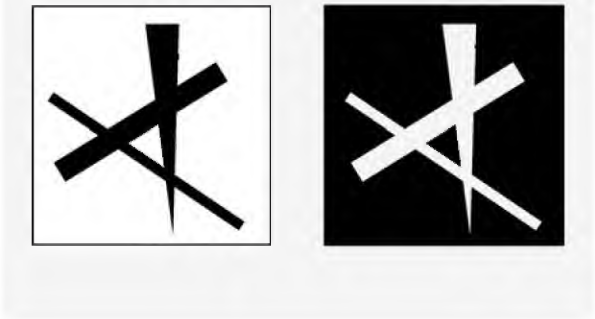
If there are several planes within planes, perception follows a hierarchy of principles: **narrow before wide**, **closure before nearness**, and **symmetry before irregularity**.

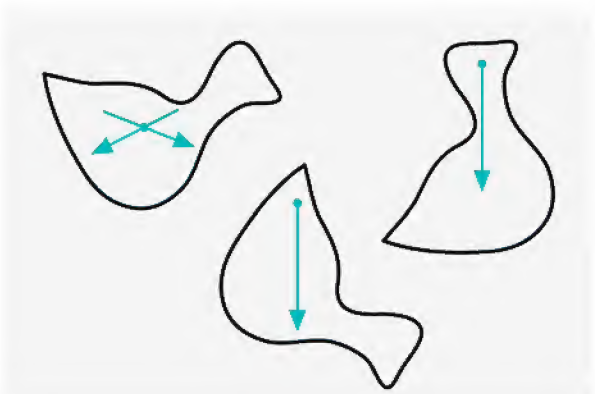
narrow before wide

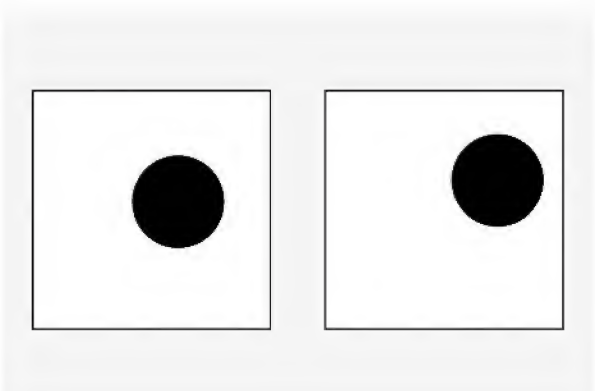
Similar figures occupy fields of influence in order to define and establish their positions and significance. These are dependent on the given forms, writes Pierre von Meiss. In this context he also quotes Arnheim, *As long as the ground is shapeless and endless, and therefore devoid of its own structure, the contours are controlled only by the positive figures. But as soon as the negative spaces* [or areas] *have any figure power at all, they too influence the contours [...] Dynamically, the vectors issuing from the inside of the dominant figures press upon the contours and try to make them expand into the surrounding space. If this expansive power goes unchecked, the figure lacks definition and floats. Its boundaries acquire perceptual stability only when the internal pressure is balanced by a counterpressure from the outside, that is, by vectors issuing from the negative interspaces. The apparent stillness of the contours reveals itself to the more sensitive eye as the resultant of pressure and counterpressure.* [Arnheim, The Dynamics of Architectural Form, 70f] In the illustration (r.) the interplay between the forces of the shapes is based on a composition by Jean Arp.

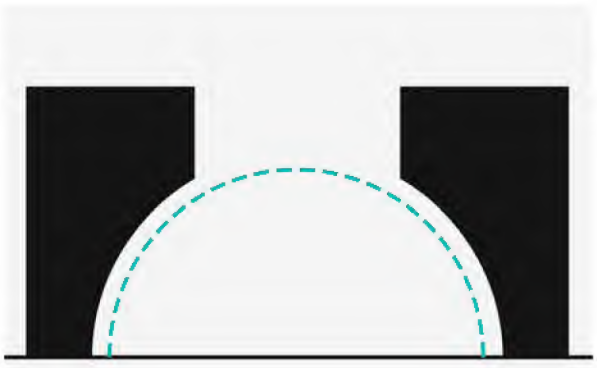
pressure & counterpressure

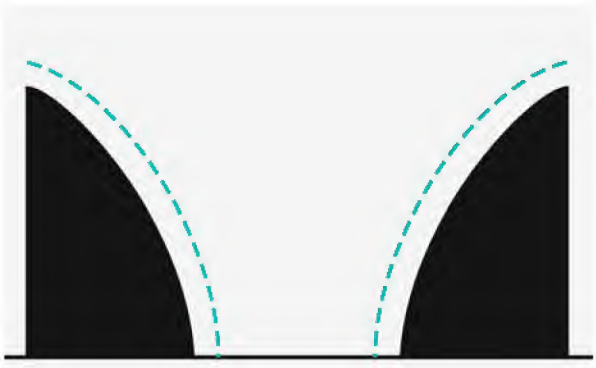


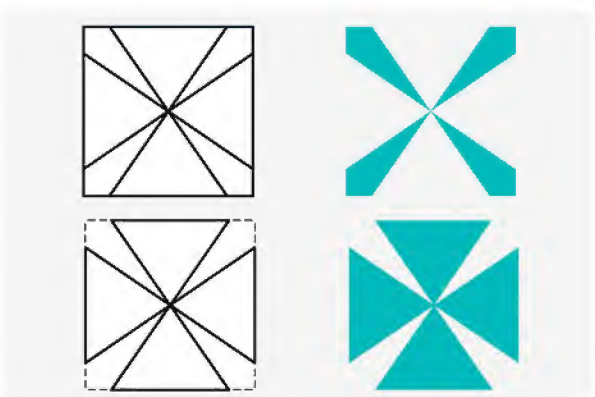


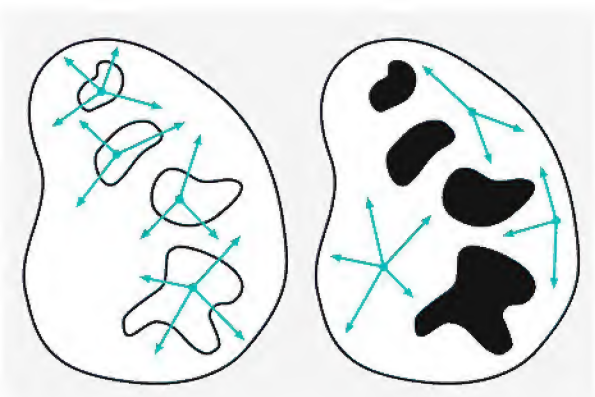












Other phenomena of perception occur depending on the varying qualities of the figures. A competitive situation arises if two adjacent fields are both equally suitable for the role of the figure. Both cannot be the figure at the same time. Famous examples of this can be found in M.C. Escher's drawings (detail of "Metamorphosis II", 1939). Such patterns show an instability and an oscillation between two or more competing images.

Leo Klenze's mosaic floor in the Glyptothek in Munich produces a similar effect. Here the viewer's perception shifts back and forth between spatial images.

competition

The Wall as a Figure. Space as a Figure

Pierre von Meiss suggests using a space alternately represented as the figure or the ground as a graphic tool. The **walls** take on the **character of a figure**, which is assumed by the **space** in the **negative representation** in the plan view of the Hagia Sophia. Similarly, *the spatial subtleties of the dome and openings […] [can be] made visible by a drawing that lets the space* [the ceiling] *appear as the figure and distinguishes it using different shades of gray.* [von Meiss, Vom Objekt zum Raum zum Ort, 36]
In each composition the negative planes have their own forms that contribute to the overall pattern. They can, however, only be perceived consciously if one inverts them with effort. When this happens, the ground can, for a brief moment, become the figure. The counterbalance of these negative planes contributes considerably to the cohesion of the positive planes.

inversion

Object and Fabric

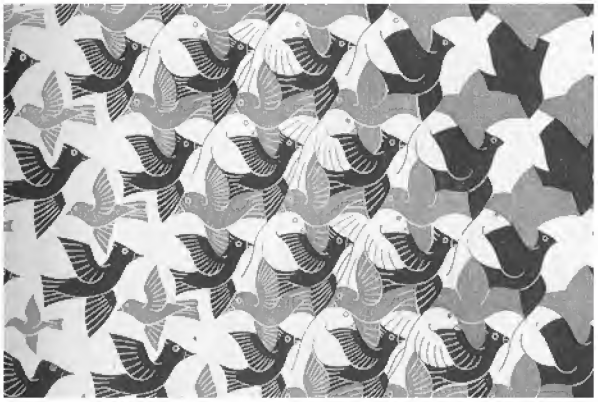
In urban development, object and fabric are analogous to figure and ground. The map of Rome drawn by Giambattista Nolli in 1748 is a typologically valuable document that clearly shows the complementarity between fabric and object, between city and monument. This depiction can also be viewed as the inversion of figure and ground since white represents the exterior spaces and public interior spaces, and black represents the mass of private residential spaces and workplaces. The map shows how buildings that have been ascribed a value as objects or monuments merge into the fabric of everyday life and how the energy fields organize the city. In the case of some sacred buildings, just the front façade announces the object character and the extension of the public space into the interior of the building. The everyday fabric recedes. In the exterior space the surrounding buildings form the primary outlines delineating the planes. The **path** is an area of movement, whereas the **plaza** constitutes a widening and is intended to provide respite, as in Vicenza (r.).

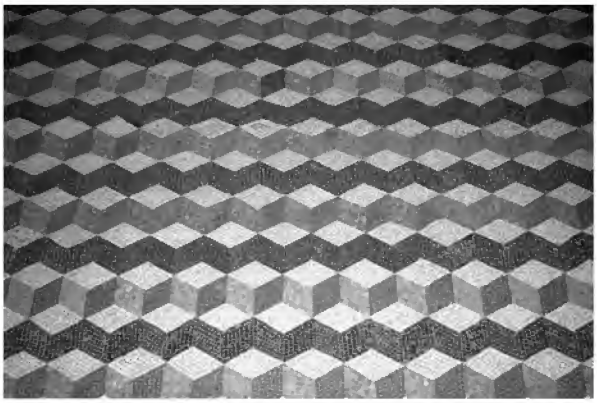
plaza

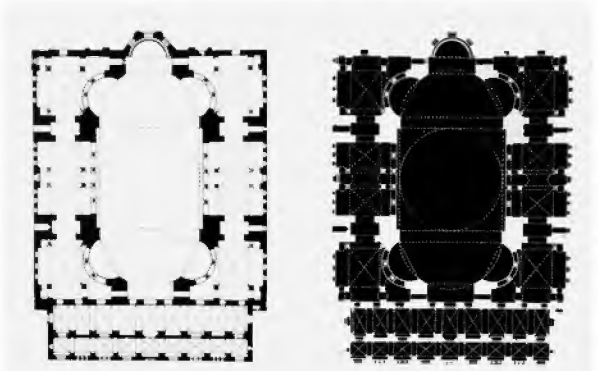
Here once again, the determining of a centered or directional plane-form also constitutes the basis for the expected dynamics of a plaza. The access and delimiting aspects further influence the qualities affecting the occupants of the plaza. Additional definition of the plane can intensify the effect, like the monument radiating outward from the center of the Piazza del Campidoglio, or a kind of carpet spread out on Bologna's town square (l.). The bigger the area, the weaker the impact tends to be because buildings and ornaments get swallowed up by the expanse.

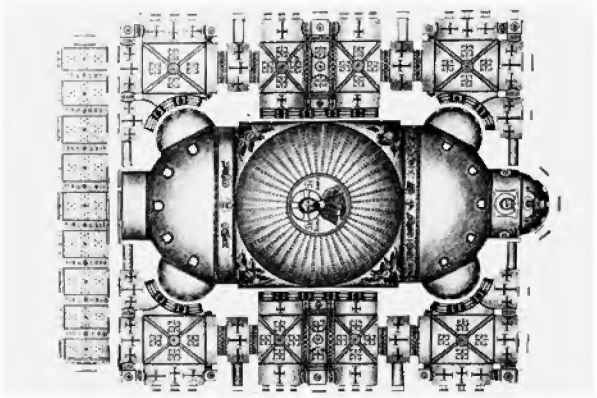
On Red Square in Moscow the surrounding buildings are too far apart and the energy fields of the elements bordering the plane can no longer resonate with each other. The plane is also sloped along the longitudinal axes, which adds to the trailing-off effect of the square.

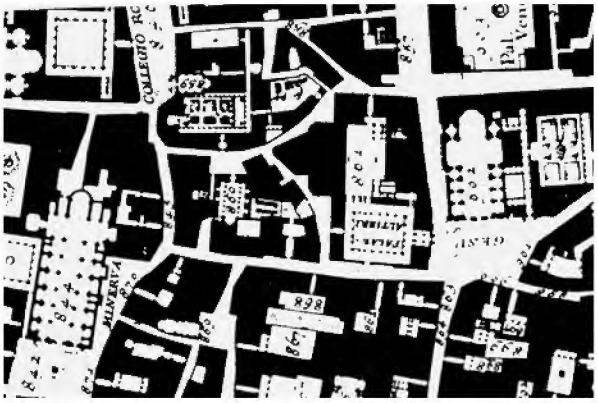
open space











Plane 2|2| The Tactile Perception of Planes

In architecture not only is visual recognition essential to the perception of basic planes, but tactile perception is as well. When walking over an area, the nerves in the soles of our feet let us perceive the quality of the surface through the kind of resistance our feet encounter. This input supplements and checks our visual perception. We can tell if the surface is soft or hard, even or uneven, safe or unsafe. This information is further enhanced by acoustic perception.
Our kinesthetic sense is also important. It helps us recognize slopes and elevation differences. Our sense of balance, a kind of spirit level in our ears, is very sensitive and also serves to check our visual perception.

resistance

Humans walk upright. They feel gravity and have a pair of eyes that sees the horizon from a given viewing level. Each departure from the horizontal plane is visually and haptically registered as it is here in Yokohama on a walkway through the International Port Terminal designed by FOA. [See also p. 148] The body's ability to maintain balance is physically translated through its joints, which are able to move in various directions. If our ankles were rigid, we wouldn't be able to adapt to uneven terrains.

Since the inclination of the ground surface is associated with climbing or descending, it also entails physical effort. An inclined plane is comfortable because it accommodates our seated posture, as the public meeting place "Philosophical Platform" by Bert Theis (Münster, 1997) demonstrates.

inclination

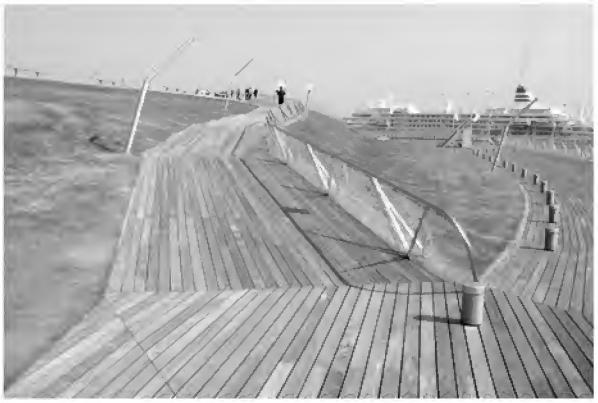
The ground or floor is the only planar element in architecture that we experience with our feet. This is a fundamental difference in the way of looking at planes as opposed to Francis D.K. Ching because to him planes also include vertical surfaces (walls). Whether or not a wall or ceiling is slanted is something we can see or measure but not sense kinesthetically. The texture of the wall is a tactile or haptic experience taken in by the fingertips; that of the ceiling is determined by visual information – thus the ceiling is an ideal plane for illusionistic painting.
The ground plane can take a number of forms:
– it can start flush with its surroundings: even, inclined, curved
– its level can differ from its surroundings: sunken, raised as a plateau, plinth or pedestal, or elevated as a platform.

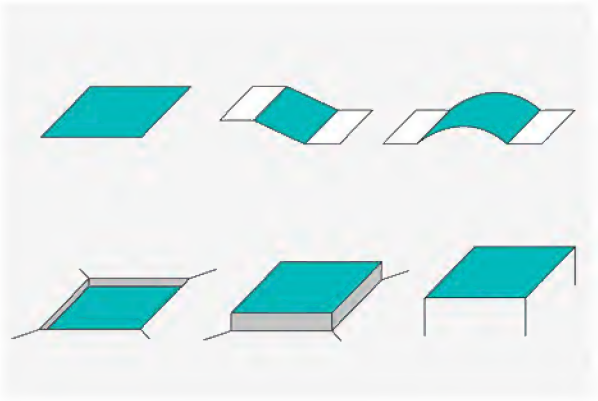
A plateau artificially built from coarse, broken stones emphasizes the plane in front of a temple at the Ise Shrine complex and marks this special area both visually and tactilely.

raised plane

In the Vienna Volksgarten the installation by the Austrian artist Renate Kordon addresses the qualities of sunken and raised. One part consists of a mown circular area in a meadow of tall grass and the other consists of an unmown circular area in the middle of a cut lawn.

sunken plane





Plane 3| Composition and Layering. The Propagation of the Planar Element

Plane 3|1| Composition of Planes (side by side)

In order to distinguish between planes lying side by side, the planes themselves can be differentiated in design or their borders can be marked using various linear elements like edge, frame, joint, and ledge. [See chap. Line 2| Separation – Partition]
Even without borders the flags in this photograph are easily distinguishable planes. In a Japanese garden we see that clear geometrical figures are not necessary to keep things recognizable, but that ordering principles like the homogeneity of material, color, etc. help to connect things into plane-like ordering elements.
Again I refer to Arnheim who once said that vision no longer seemed to go from the particular to the general but that overall structural features were the primary perceptual data.

fillings

How do planar elements distinguish themselves visually from their surroundings? As long as the planes are represented as isolated elements, it is relatively simple to distinguish figure and ground.
These two details of paintings by Piet Mondrian, however, show that this isn't always easy. In the first picture the colors or the borderless solid planes define the figure on the uniform ground. Through the interplay of their forces the planes seem balanced because *in successful paintings, truly empty spaces, devoid of such countervailing forces, are quite rare. […] It is also true that the figure forces acquire their true vigor only through the resistance of their environmental antagonists. A punch into empty space evaporates.* [Arnheim, The Dynamics of Architectural Form, 71]
In the second example it becomes difficult to determine whether a boundary line belongs to one plane or the other because each is part of both planes. All planes are equally powerful.

As soon as planes overlap or are superimposed, the question of dominance arises. This can lead to an increase in impact or as the result of a kind of interference. It can make one of the two planar areas disappear.
The light installations by James Turrell make the viewer wonder whether he is depicting emptiness or object. Does the frame delimit the outer or inner field? Is it a frame or a joint, figure or ground?

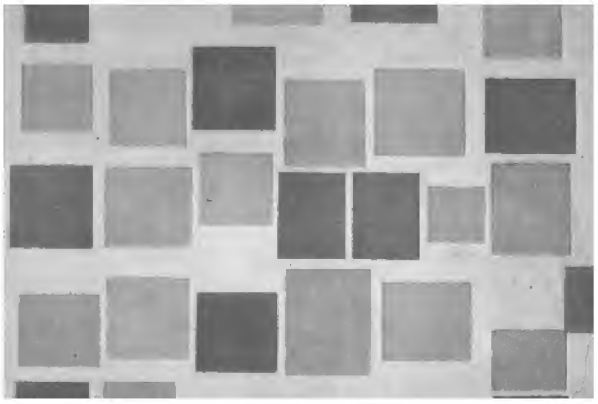
outlines

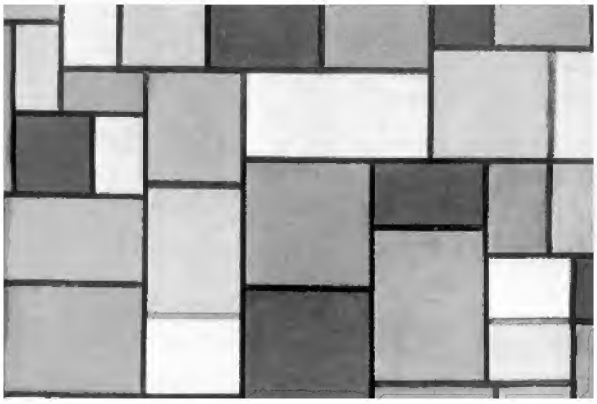
Different material surfaces are separated by joints, that is to say negative spatial borders. A groove-like depression in a plaster surface is enough to mark off individual planes.

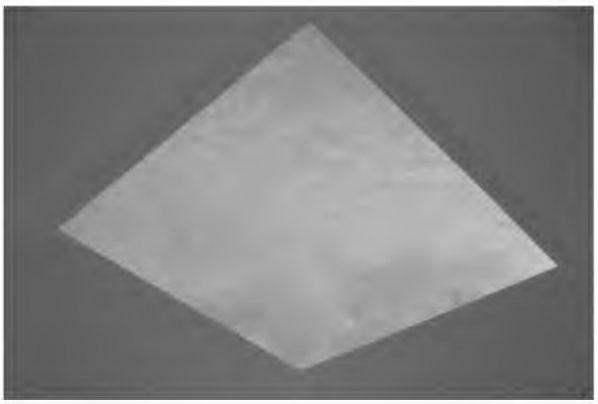
The plane in the form of a tatami mat measuring roughly 90 x 180 cm constitutes the traditional basic unit of a Japanese house. In various arrangements the number of these rectangular mats determines the size of the room. Edges are usually marked by colored fabric borders. It is possible to estimate the size of the room at a glance.

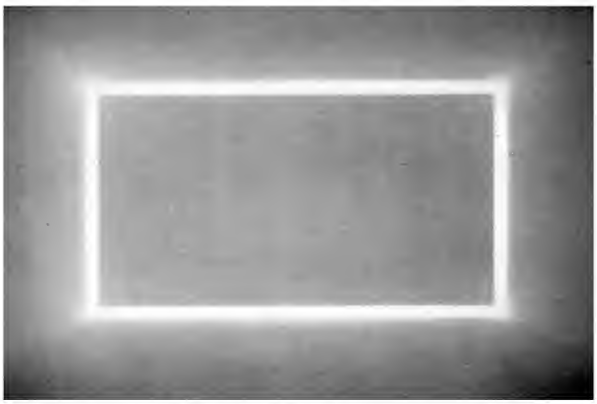
modules


セーター
ブラウス









Plane 3|2| Layering of Planes (on top of each other)
Horizontal planes can be layered in order to overcome height differences. The lowest point forms a spatial center if they are grouped around a middle, as is the case here with stone platforms forming a stage between steps which can act as bleachers.

On Graz's Mur Island designed by Vito Acconci the curved steps simulate the contour lines of an island landscape. The curved form serves to stiffen the structure and provides a platform for an open-air theater.

layering

Although a horizontal plane generally represents a neutral base, it can express hierarchies in respect to another horizontal plane. This is why height differences often imply different levels of importance as the plinth layers of the buildings in the Forbidden City demonstrate.

In the Indonesian temple complex Borobudur the numerous layers of platforms symbolize the different levels of catharsis. The bottom four levels pertain to the earthly, the upper three to the heavenly zones.

plateau

The composition of an object's base is often the key to whether it belongs to the object or the base plane below. In the case of this Chinese incense burner, the elevated base serves as a pedestal and from the material perspective belongs to the ground plane.

Emphasis of Planes

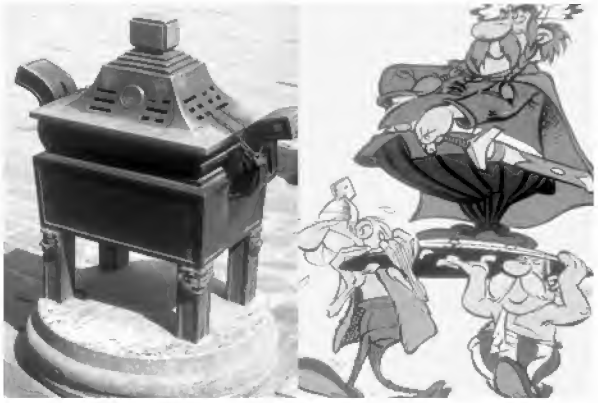
If we move a special object from one place to another, we make it literally "stand out" from its surroundings. The higher it is raised above the ground, the more important the object seems to be. Here we see Majestix being carried on his shield. The phenomenon of signifying importance through elevation differences can also be witnessed in religious ceremonies. The holy object is taken from its protected surroundings and must pass through a profane environment without losing its importance. Thus it is consciously transported above the quotidian level – as here with the Madonna statue in Bamberg, Germany.

exaltation

Plane 3|3| Elevation of Planes
Special ceremonies are not the only occasion for which we raise planes off the ground. As portable objects, planes like chairs, tables, and beds are "elevated" to add to their comfort in everyday life. Here we see an Afghan vendor's sales table that doubles as his bed.

In the so-called "first world" people no longer sit on the ground plane but on chairs. The simple and stable version of a sitting plane in the form of a three-legged stool corresponds to its geometrical definition: stabilization of a plane at three corner points.

lifting



A plane raised high enough above the ground plane will eventually reach a height that allows us to stand beneath it. Low ceilings can still be experienced with our hands, higher ones can only be perceived visually. Raising a plane in this way requires enormous effort to counteract the force of gravity.
Every overhead plane is perceived as being **above**, and this covering structure is consciously or subconsciously checked to make sure it is sturdy.
This parking lot and restroom facility located near Niigata, and built by the French architects R&Sie, seems to thrust the ground up over our heads.

This effect can only be achieved by solid or filled planes. A plane that is only defined by outlining articulates a spatial area but is not perceived as “above” because it is open at the top, for example the town square in Querétaro, Mexico.

ceiling

There must be a base plane below, before we can define a ceiling. The tension between the base plane and the ceiling densifies space, which is necessary for its formation.
If the base plane makes no reference to the overhead plane, no tension is generated between the parallel planes and the space remains just a zone as we can see beneath the O-Museum by Kazuyo Sejima. [See also p. 88]

A ceiling is held or thrust up by point-elements or linear elements, which not only play a structural role but also characterize the transition to adjoining areas. On the plaza in front of the HUD building in Washington, D.C. Martha Schwartz supports large illuminated discs by thin poles placed around their inner rings. With openings in the middles of the discs, which help to counteract the densification of space, she creates the impression of hovering objects.

zone

The extent to which the parallel layering of planes is perceived as spatial densification depends on different factors, e.g. resonance, expansion, distance of the overhead plane from the ground, and the composition of the supporting structure and ceiling.
In the entrance area of the museum of the Byōdō-in temple in Uji in Kyoto Prefecture the ceiling design consists of louvers. In this area the spatial densification is less noticeable than in the adjoining waiting area where the floor and ceiling planes make clear reference to each other. This effect is further intensified by the raised platform of the floor and the low, unbroken ceiling plane.

densification

Spatial densification can be consciously minimized if proportions are large. Tension and dynamics get swallowed up if the basic form is so large that it is no longer clearly recognizable, as with the planes of town squares discussed above. [See chap. Plane 2|1| Directional Planar Elements]
The Sendai Mediatheque by Toyo Ito is conceived primarily as a multifunctional gathering place for people. The building interior and the surrounding urban space merge without changes of level in order to minimize the sense of threshold. The space-bounding elements are viewed as climatic necessities and designed to be as transparent as possible. The parallel layering of floor and ceiling allows exterior space to flow through visually unhindered. The supporting structure is broken down into pillars of individual strands interwoven to create spatial cohesion and permit permeability.

dissolution

Plane 3|4| Stacking of Planes (one over another)

Every elevated, level plane that we recognize as a ceiling plane **as viewed from below** exhibits a corresponding plane when viewed from above.

Le Corbusier developed the Dom-Ino houses as a form of standardized mass housing in 1914. By taking advantage of the structural properties of the reinforced concrete building it was possible to separate the functions of load-bearing and space-forming elements. This led Le Corbusier to formulate his five points: the house on pilotis, open floor plan, facade free from the supports, ribbon windows, and roof gardens.

Werner Sobek designed the Triple Zero® house enveloped by a continuous glazed skin in Stuttgart called Objekt R 128. A steel skeleton bears the weight of the partially open ceiling segments between which the rooms extend and merge into a multilevel spatial volume.

stacking

The roof conceived as an umbrella is an important element in Johannes Spalt's architecture. He differentiates between the *partially directional canopy* that is curved downward on two sides and the *total canopy* whose edges curve downward on all sides. Even if the boundaries on all sides are only alluded to and exist only to a minimal degree, they still suggest the containment of space. Spalt speaks of *baldachin architecture* when the entire roof seems to hover in this tension between floor and ceiling as if hanging from above. [Johannes Spalt, 106, 110]

Based on these principles the roof of Dr. Maier's house designed by Spalt in Neupurkersdorf, Austria (1980–82), is conceived as a canopy curved on two sides.

space formation

The stacking of several ceilings one over the other in multi-story buildings constitutes a propagation of planes and thus an increase in space for storage or lingering.

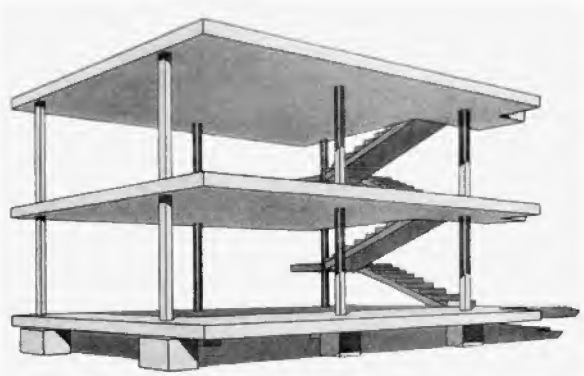
To enhance this effect, the designers BKK-3 employ a stacking of planes combined with three-dimensional deformation in the apartment complex "Miss Sargfabrik" in Vienna. The use of different floor heights produces spatial densification in individual areas. Various ceiling heights both densify and contain space.

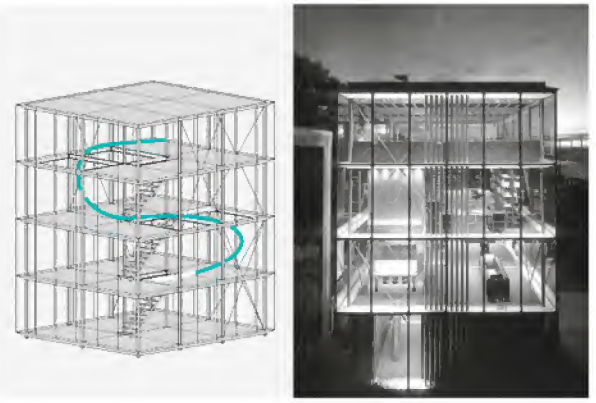
deformation

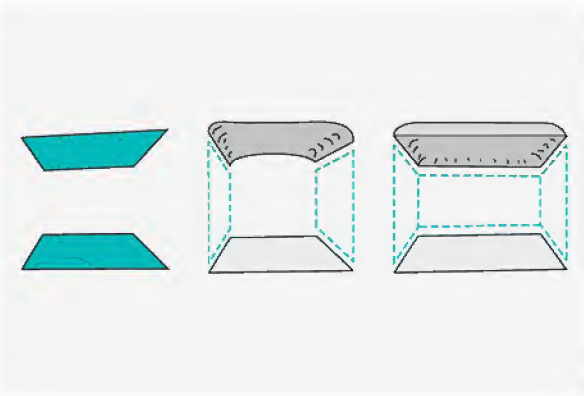
Planar volumes have a rather flat and wide overall appearance. As opposed to point-element volumes, planar volumes correspond to a lying object rather than a standing one. They can be regarded as solitary planar landmarks in this sense. From the pedestrian level, however, they are not at first glance recognizable as such and can only be taken in by moving around the object's perimeter. An example of this is the Cinema Vulcano by Oscar Niemeyer, which was erected in Le Havre on a plane that lies below the level of the surrounding city.

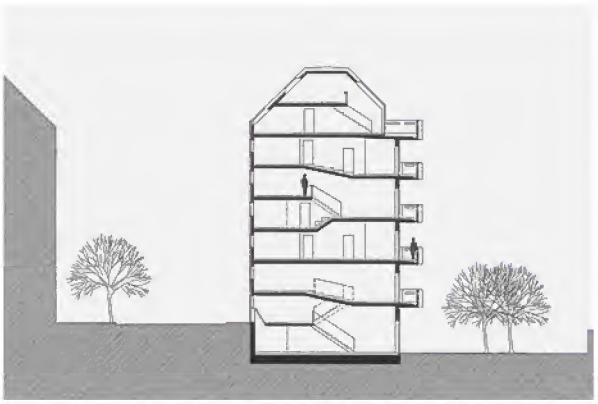
The Dutch architectural firm MVRDV designed an almost square exhibition space in Nagaoka, Japan. Its entranceways at the corners are in the form of four angled tubes which hold up the structure. A covered outdoor area beneath is formed in which the spatial densification is perceptible through the upward-thrusted building mass.

planar volumes









Space

Space is defined by its **boundaries**. In the preceding chapters the forms of point-elements as well as linear and planar elements were examined in terms of architectural space and in respect to the tension and dynamics inherent in them. In this chapter we will be investigating these insights in terms of their impact on space, whereby the effect must always be regarded in relation to the given context. While the horizontal planar element determines the form of the space, the vertical point-elements and linear elements mainly define the space's relationship to its surroundings.
To experience space without borders, german climate engineering firm transsolar and japanese firm Tetsuo Kondo Architects created an atmosphere of the immaterial lightness of clouds at the Architecture Biennale in Venice in the arsenale. Winding ramps led the visitors through three distinct layers of climate: on the ground level, the air is cool and dry, while half way up the ramps among the clouds, the air is warm and humid. When you finally come up above the cloud layer, the air is hot but moistureless.

spatial experience

Space 1| Space Itself

Spatial Experience

The spectrum of experience extends from a centered anchoring of space through the one-point perspective, as in the Teatro Olimpico in Vicenza, to the formation and dissolution of space through external influences. The art historian August Schmarsow was the first to emphasize the spatial in architecture in today's sense of space, into which the viewer's movement is incorporated. He founded the **dynamic model** of how we understand and design space. This dynamics of perception took a new twist on the static observer, as exemplified in Oskar Schlemmer's "Frauentreppe". It was a revolution over the concept of a static viewpoint.

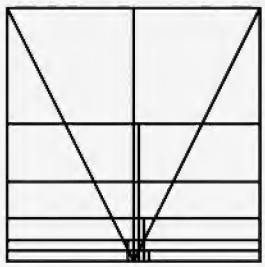
motion

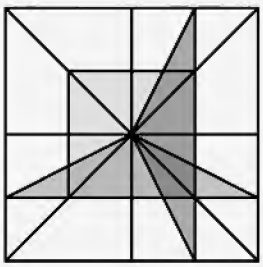
The ability of man to experience his surroundings as a whole brings us to Giambattista Vico's concept of **"body fantasy"** (1730). Rejecting Cartesian rationalism, Vico claimed that language, myth, and customs are the metaphorical legacy of mankind. Vico's theory of repetition does not only reason on a linguistic and mythical but also on a physical level, according to which the body reconstructs the world through its tactile understanding of reality. This is suggested through the mind-body influence of form and through man's tendency to perceive form through the sense of touch as he feels his way through the labyrinth of architectural space. Kenneth Frampton describes this in his "Studies in Tectonic Culture", citing Adrian Stokes: *People touch things according to their forms […]. The perfect sculpture needs the hand in order to convey life and warmth, to reveal subtleties that the eye overlooks.* [GDA 12f].
The spatial installation (r.) was designed by Zaha Hadid for the MAK in Vienna in 2003.

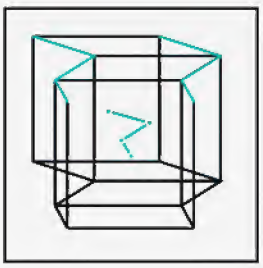
body

Man is not a dualistic being in whom spirit and flesh are essentially distinct, but a corporeal being active in the world. The "here and now" in which the body is placed in what is first taken for granted, and subsequently a "there" appears. Through a perception of that distance […] the surrounding space becomes manifest as a thing endowed with various meanings and values. Since man has an asymmetrical physical structure with a top and a bottom, a left and a right, a front and a back, the articulated world, in turn, naturally becomes a heterogeneous space. […] The world articulated by the body is a vivid, lived-in space. The body articulates the world. At the same time, the body is articulated by the world. When "I" perceive the concrete to be something cold and hard, "I" recognize the body as something warm and soft. In this way the body in its dynamic relationship with the world becomes the Shintai. It is only the Shintai in this sense that builds or understands architecture. The Shintai is a sentient being that responds to the world. [Tadao Ando, Shintai and Space, Studies in Tectonic Culture]

The form of the ENZIs by PPAG at the MuseumsQuartier in Vienna inspires visitors to lounge in various positions.







Spatial Perception

Usually one conceives space as empty. This philosophical approach interpreted from antiquity presupposes this emptiness as characteristic of space in the sense of the traditional concept of the vessel. This applies to interior as well as exterior space. Objects occupying space seem to displace a part of the previously existing space. The mass and form of the objects generate the real and imaginary fields of tension. If these fields have enough space to spread out, the displacement of space is barely noticed and the objects present themselves freely like individual objects on a tray.

The fields of tension and the dynamics of the forms also produce relationships between the objects – like on the Piazza dei Miracoli in Pisa: The axis of the cathedral orients itself with the baptistery. The tower as a second centered object is shifted off the main axis and stands autonomously on the lawn. Through its constellation it still belongs to the overall composition.

overall space

Each object occupies and displaces space. Depending on mass, proportion, and distribution, this spatial displacement is perceived differently in the surroundings. **Spatial densification** occurs between the objects depending on their form and interstitial distance. The tension or energy fields of the inserted objects enter into a relationship and influence the dynamics of the remaining space. [See chap. Point 2|]

If the surrounding space is limited, the fields of tension of the objects run up against boundaries or even overlap, producing further densification and making the dimensions tangible. Judenplatz in Vienna with its casting of a library as a memorial to the victims of the Holocaust by the artist Rachel Whiteread is such a space.

Donald Judd places his cast of the Baroque “Dubsky Room” inside one of the exhibition spaces of the MAK with the intention of making spatial volume and body perceptible from outside and inside.

surrounding space

If individual units or objects are placed very close together, the field of tension in the space in between can become so dense that it discourages visitors from lingering. Instead this **interstitial space** is perceived **as a part of the object** and ultimately becomes part of the **overall whole**. Such arrangements can occur in various degrees of intensities.
An installation consisting of a dense forest of elongated cast forms in which trees have been planted stands outside the Jewish Museum in Berlin designed by Daniel Libeskind. Their placement suggests a kind of disintegrating volume, slightly askew and threatening to sink into the ground. This impression becomes stronger when one walks through the deep, narrow crisscrossing pathways.
The interstitial space is clearly recognizable as object space in the Spiral of Töölönlahti Bay built by the Japanese artist Takamasa Kuniyasu in Helsinki in 2000. It is nothing more than space kept free of matter, just air as part of the whole.

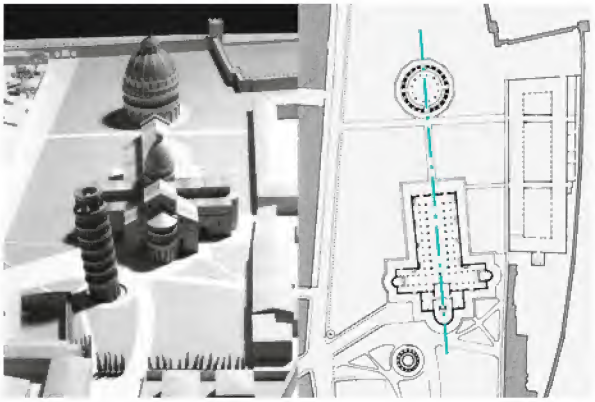
object space

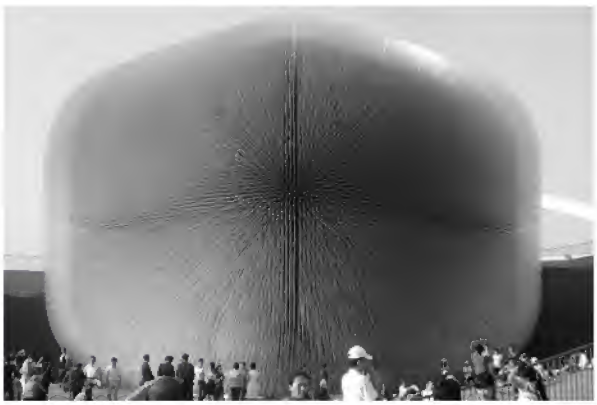
Based on these examples, we see that **spatial perception** depends on **spatial densification**.

No relationship can develop between their fields of energy if objects lie too far apart. In 1992 Prof. Helmut Richter’s architecture students at the University of Technology hung plastic tubes in the courtyard of the MuseumsQuartier in Vienna as a spatial installation to make an unintentional **leftover space** in between the buildings consciously experienceable. These individual elements effected a spatial densification and reinforced the perceptibility of the courtyard space. [See chap. Point 3|2| Spatial Arrangement]

The United Kingdom’s pavilion at the Shanghai Expo 2010 is an iconic seed cathedral meant to be a new version of the Chrystal Palace. A composite frame of steel and timber is pierced by 60,000 square fibre optic filaments which transmit sunlight to the interior. Since the rods are close enough together, they appear as a solid form from the exterior.

space in between





Spatial perception, therefore, has to do with spatial densification. Objects produce spatial densification, giving rise to surrounding or interstitial **space**. The objects themselves are vessels and surround space that has either originated from a **full** or **empty** state.

Solid mass that in a tectonic sense rests squarely on the earth's surface displaces exterior space and gives rise to surrounding space. For example due to its mass this mesa in southern Tunisia (r.) appears to be centered on the surrounding desert plane. In this context it functions as a point-element. Its field of energy has enough space around it to spread out. In the vast surrounding space it assumes the role of a reference and orientation point.

hollow or full

Space 1|1| Body and Mass. The Space is Full
One notion of space is that it arises through the displacement of matter in a full volume. For humans and other mammals our first dwelling is the uterus, which expands like a protective cave around the growing being – a **bodily experienced space**, which is left behind at birth.
The "hollowing out of a solid" occurs in inorganic nature too. The cave is one of the oldest forms of human habitation. Floor, walls, and ceiling are gently curved and merge into each other. This primal impression of space as well as one's sense of body can play a key role in our perception of space because curved or slanted walls and ceilings are space-forming, even if the boundaries are rudimental.

hollowing out

If there are no mountains or hills, we can still dig into the ground. While a cave affords a view of the outside world at the same level, a space dug into the ground offers no horizontal view of the surroundings. It always retains the characteristics of a pit that one looks and climbs down into. In this case there is no dialogue between exterior and interior, rather a valuation of **above and below**.
Troglodyte complexes in Matmâta, Tunisia surround a courtyard pit that serves as "outside space" and provides access to the "interior spaces". The climatic advantages are obvious. The view, however, is limited to the sky. For this reason this housing situation can be perceived by inhabitants as isolating.

digging out

These natural conditions of hollowing out are supplemented by added layers, as in this Tunisian village.

This applies to the cities of both the living and the dead. With cult and sacred buildings there are many examples of the combined application of digging out and adding to: the Lycian rock-cut tombs in the southwestern part of Turkey, or as pictured, the Hatshepsut mortuary temple in Egypt (r.).

adding to

In our imagination space can be produced by hollowing out or delimitation. Hans Hollein addresses the subject of architecture and space on the invitation to his exhibition at the Forum Zumtobel in Vienna in 2003 with this illustration of "piling and digging". The **digging** into a solid can produce a series of free form spaces within the given mass, as we can see in his design for the Guggenheim Museum/Mönchsberg, Salzburg. Digging means displacing or removing material, while **piling** and building is an accumulation of material and work against gravity.

digging

One simple form of building is **piling** or **stacking**. The accumulation of material requires that its weight be removed from some other place. The tectonics of the transfer of weight to the ground can be clearly seen in the form of compressive forces. (*tekton* [Gr.]: "carpenter", "builder", in general a craftsman who works with hard materials). We understand tectonics not only in a technical but also in an aesthetic sense, namely, the art of setting and joining. In the construction of pyramids, as in Saqqara (r.), mass or volume is formed through stacking, and the transfer of loads is expressed via compressive forces. Inside, hollow space is created through layering and false vaults.

To Günther Feuerstein, stacking (Errichtung) includes piling or heaping – mountain and step – which are both objects that can be climbed. The opposite might be the erection (Aufrichtung) of structures not intended to be climbed, such as pole and tower, menhir, obelisk and stele.

piling

Juxtaposed to the theory of the origin of space as a natural **cave** in an existing solid or an underground cave with the addition of weather protection is Laugier's principle of the **primitive hut**, in which forked branches were used to erect a frame on which protective wall panels were mounted. Gottfried Semper regards the wall similarly as a layer of clothing, or textile, rather than a load-bearing element.
From a behaviorist perspective, the natural cave is a completely protected space, whose entrance is easy to guard but is at the same time the only escape route. Moreover, the interior of a natural cave is connected with uncertainty and fear because of its unknown extents and unknown inhabitants.
The primitive hut built on a hill beneath a protective tree is a contrast to the cave. Such a dwelling is exposed and open to view, but it provides its occupants with a good vantage point and freedom.

erecting

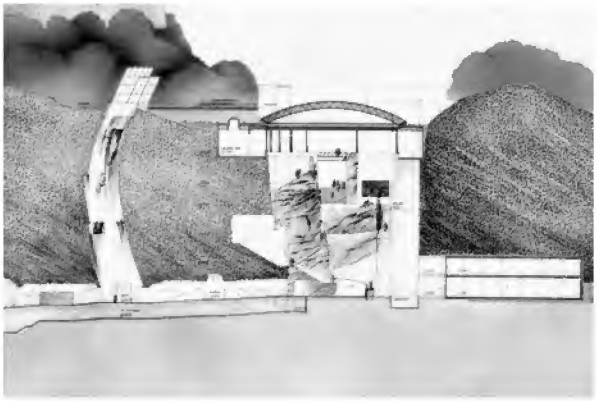
In a physical sense the formation of space is about protection from the elements and maintaining body temperature. This task can also be fulfilled by an enveloping layer of clothing. Different layers of materials and forms are adapted to the given external conditions. For example, a coarsely woven burnoos with its head covering protects the wearer from heat, storms, and fine sand. The human body itself supports this protective material.

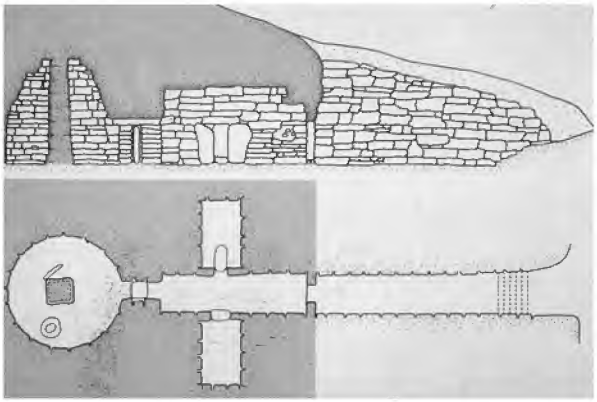
If not only the body but also activities are to be protected, one creates distance between the body and the enveloping layer. The enveloping material is held in place by additional supporting and load-bearing structures so that people can move around freely and still be protected within. A tent (r.) is a simple example.

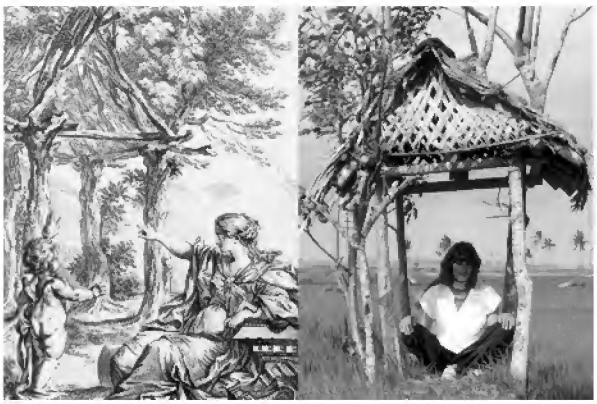
enveloping

HANS HOLLEIN

Aufbauen und Aushöhlen







Space 1|2| Volume and Boundary. The Space is Empty

As long as a space is enclosed by a mass like a cave, it is clearly defined and experienceable. The surrounding material is usually homogeneous, often wall and ceiling merge and become one, sometimes the floor as well.

Space can also be defined by its borders which are formed from point-elements, linear, or planar elements. If these elements enter into a relationship with each other, a **spatial field of energy** characterized as spatial densification is produced. These relationships form between both vertical and horizontal elements. Depending on their arrangement and composition they create different spatial qualities. From a purely geometrical perspective three corner points form a plane; so at least three corner piers suggest a delimited volume marked off from infinite space.

relation

Space 1|2|1| Space Formed by Vertical Elements

Vertical Point-Elements

Vertical point-elements can assume a degree of importance by individual positions in their surroundings and by virtue of a similarity. They are perceived as linked together even in a heterogeneous environments. [See chap. Point 3|2| Spatial Arrangement] They form **spatial fields** of varying densities depending on distance and proportion.
The holy district of the Japanese Shinto temple Suwa Taisha has been marked off by four tree trunks since roughly 200 B.C. Today this conceptual space is populated by many buildings and young trees. Still the four “pillars” that define the original spatial field are recognizable. They are replaced every seven years in a process of continual reconfirmation of this “holy space”.

spatial field

Linear Vertical Elements

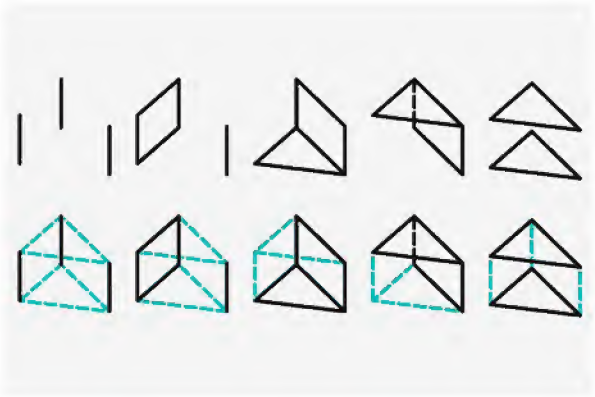
The façade of the Storefront Gallery by Vito Acconci and Steven Holl in New York appears to be a continuous wall. Façade sections can be swiveled out up to 90 degrees so that they intrude into public space. This opened position creates **spatial niches** and **corners**, which form a kind of semi-public area in front of the actual exhibition spaces. The public space of the sidewalk can in turn flow into the spaces of the gallery.

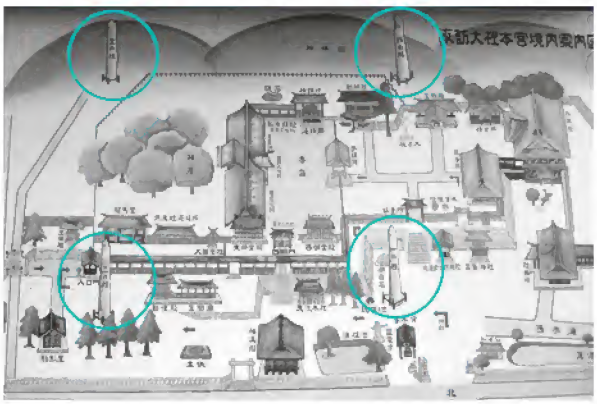
division

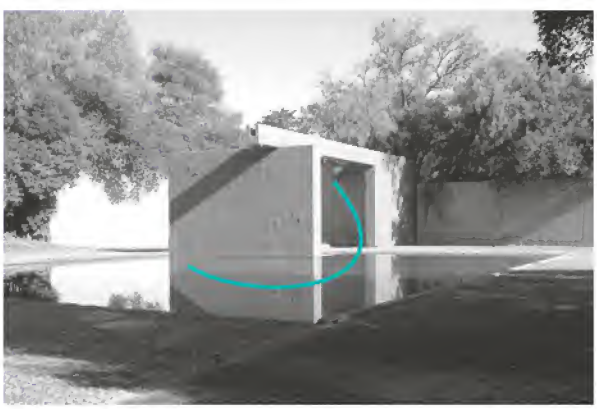
Richard Serra’s steel slabs partition the space. Its angles create narrow spaces and niches as well as wide corners that open themselves invitingly to the surrounding space. The composition induces a state of precarious balance with slightly slanted slabs that are propped up as if supporting each other reciprocally. There is no secure or stable area in this composition.

Louis Barragán defines a fountain in the housing estate Los Clubes with high wall slabs. The “Fuente de los Amantes” emphasizes its ties to its surroundings through generous openings. A water spout connecting the walls appears to rest atop the walls to avoid interrupting the upper edge of the space and to allow a “space in the space” to arise. The fountain stands with one foot in the water to reinforce the interplay between ambivalent spatial zones – thus producing a spatially circulating relation with the surrounding field.

assignment







A linear space is created between parallel linear elements like walls. This linear space **divides** the entire space and serves to **direct** and **guide**. In an installation by the Korean artist Kim Sooja at the Kunsthalle Wien pieces of cloths hung at different intervals demonstrate the creation of several spatial rows with transversal pathways at intervals.

In an installation by Richard Serra in Basel **curved**, **concave wall slabs** separate a **contained area** within an exterior space. Through the double parentheses, curved passageways are formed on either side, The walls lean toward each other at certain points, creating a narrowing of space and densification above the pedestrians. Elsewhere, the walls lean away from each other, allowing space to escape at the top. [See chap. Plane 2|1| Narrow before Wide]

orienting

Space 1|2|2| Space Formed by Horizontal (Planar) Elements

Paul Klee's spatial conception develops from the movement or tension between horizontal, planar elements. A **basic plane** above which space can develop is the main prerequisite for every kind of spatial formation. The **overhead plane** must generate a kind of **resonance** with a base plane of the same size and figure in order to allow this spatial relationship or tension to arise and be perceived. In Klee's notion, the basic plane is lifted upward and becomes a space that can be seen as the interior view of the space. Observed from the outside, the given area between the two horizontal planes is densified in the overall space.
Permeable coverings like this festival decoration above a street can play a decisive role in the temporary formation of space-forming horizontal planes located above the viewer.

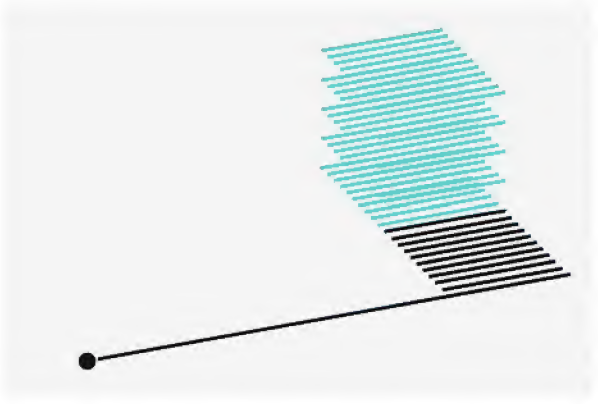
covering

The Nordic Pavilion in the Biennale Garden was designed by the Norwegian architect Sverre Fehn in 1962. Narrow reinforced concrete beams that appear as a louvre arrangement cover the exhibition space. The space is open on two sides and interacts strongly with its surroundings. Several trees that the architect wanted to maintain as the heart of the building pierce the ceiling. The pavilion seems to consist only of light, trees, and art, yet the floor, the ceiling, and the two wall slabs at right angles clearly define a subtly densified space.

The Barcelona Pavilion by Mies van der Rohe is formed by horizontal planes and vertical wall slabs. Here the idea is to densify but not contain space. Varied floors and cantilevered ceilings produce subtly differentiated zones. These interact with the wall slabs producing areas with ambivalent and overlapping spatial effects.

The space in the traditional Japanese home spans vertically between the floor and ceiling planes. Unlike in the European house, the walls here have a space-forming but not a load-bearing function. The often translucent and movable walls are spatial partitions. The roof is supported by pillars.
Traditional Japanese houses are usually surrounded by a continuous platform. The area between the floor and the ceiling ("engawa") forms an "in between" space – between inside and outside, between built and nature.
In his book "In Praise of Shadows" the Japanese poet Tanizaki Jun'ichiro describes the form of the Japanese house as a relationship between the shadow of the cantilevered roof and the platform above the ground.

zoning



Space 1|2|3| Space Formed by Combining Vertical and Horizontal Elements

Spatial densification is more clearly perceptible if there is resonance between a plane and its corresponding floor or ceiling plane. If the floor or ceiling extends into a wall – even if the wall itself is short or a stub – this suggests containment in addition to tension alone. Rather than the free flow of the overall space, the spatial volume in the contained area seems to "stand still". A lookout pavilion in Bayreuth is an ideal example of the resonance created by the space-densifying interaction of the ceiling and floor planes. The visitor is embraced by the guardrail, while the slender, radially placed pillars emphasize the possible lookout directions.

resonance

Space is articulated even more clearly if the ceiling on all sides merges into the top of walls. This walk-in object designed by Erwin Heerich has lintels running all the way around the structure that give the object the impression of a container turned upside down over a space. The articulation of the corners of the space and the vertical edges clearly define the boundaries of the ceiling and project them toward the base plane.
Even the protective space as an image of the heavens (r.) minimally defined and carried along in a procession does not lose its effect.

Through the **combination of horizontal and vertical elements**, **space** can be not only **defined** and **densified** but also **contained**.

containing

The floor and ceiling planes held up by cruciform columns define the spatial zones of the Barcelona Pavilion. The walls placed within divide and separate. Corners are largely avoided to keep from interrupting the spatial continuum. Only at a few places do the ceiling and walls touch and arrest the spatial flow.

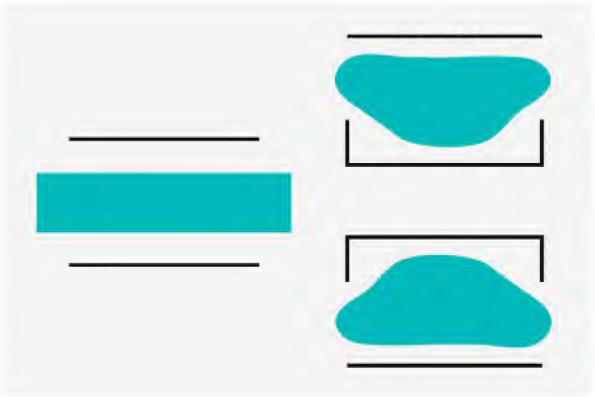
The Schröder House by Gerrit Rietveld shows the composition of intersecting wall slabs that define space and volume. Revolving and slidable wall sections inside allow the occupant to create or close off various subspaces.

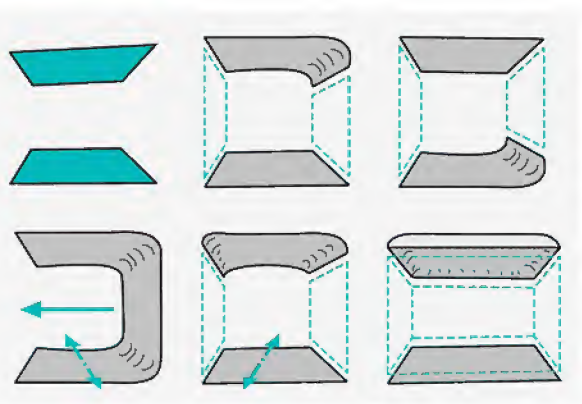
crossing

Bending and Folding

A rounded interface between the floor and ceiling contributes much more strongly to a spatial impression than an angular connection. If floor, wall and ceiling are thus treated as a continuous band surrounding a space, we call this **folding**. In a Japanese vacation home by Shigeru Ban the **upward bending** of the floor contains space on one side only. The fold forms the back wall. The movement necessary to create a fold is perceptible as an inherent momentum in the folded space. It forms the backbone of the space and directs orientation toward the open side. Even if the curved band is very wide and generous, this orientation remains dominant. This also applies if the width of the band is greater than the depth of the folded space. There is also a strong lateral dynamics between the two sides of the band in this spatial form, similar to a half pipe.

bending





Inflection is the ideal genetic element of the variable curve or fold. [Deleuze, The Fold, 15] Here Gilles Deleuze cites Paul Klee, who explores the forces of free lines in his work "The Theory of Modern Art". [See chap. Line 1|2|3| Free or Flexible Lines] With a succession of three figures Klee demonstrates the following properties: *The first draws the inflection. The second shows that no exact and unmixed figure can exist. […] The third marks the convex side with shadow, and thus disengages concavity and the axis of its curve, that now and again changes sides from the point of inflection. […].* [Klee, Pedagogical Sketchbook] *The second set of transformations is projective: such transformations convey the projection, on external space, of internal spaces defined by 'hidden parameters' and variables or singularities of potential.* [Deleuze, The Fold, 16] Through folding and folding back, new concave and convex forms are produced that generate complementary undulations on the reverse side.

inflection

Using load-bearing corrugated metal for his studio/house "Springtecture B" in Biwa-cho, Shiga, Shuhei Endo implemented the idea of the fold and made it directly visible and experienceable. Interior and exterior space are enclosed and connected with a continuous sheet of straight and bent segments.

In their duplex in Utrecht, Bjarne Mastenbroek and MVRDV "folded" the two single-family units into each other. This multilevel space is interlocked and wrapped although the transitions from floor to wall to ceiling are marked by right angles. The dynamics of the space is directed toward the open sides like in structural tubing. The open ends are articulated as fully glazed walls that afford a view through the entire depth of the house. Loos' Raumplan can be experienced here three-dimensionally in diagonal space.

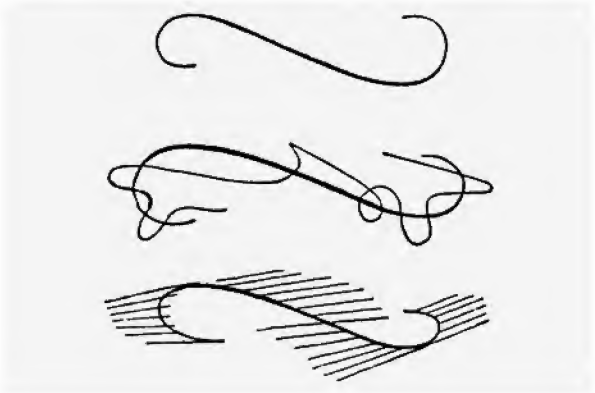
fold

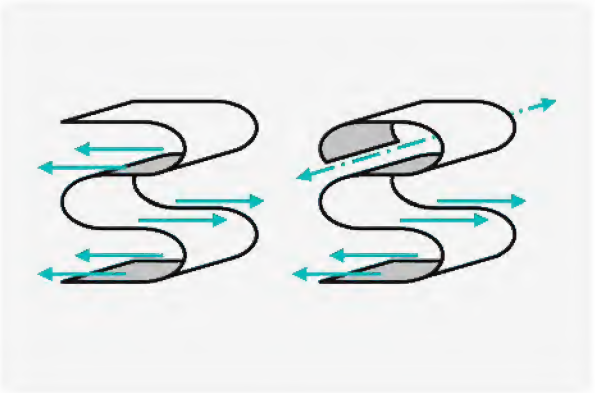
Claude Parent, post-World-War-II French architect, deals with the relation between mass and movement in order to develop a new principle of spatial organization from an original twentieth-century architectural motif. Through theoretical studies and designs such as his drawing "Inclipan", 1974, Parent explores the destabilization of the architectonic volume and experiments with new forms of interlocking spaces and spatial continuity. Claude Parent calls for the dynamization of space through slanted planes. This concept influences a series of architectural designs. *In a world that has transformed everything – objects to energy, the point to a maze – we can no longer separate living and movement, thus two possible courses of development stand face to face:* Either one makes architecture movable or movement inhabitable […]. [Paul Virilio in: Architecture Principe 3, April 1966] The concept of dynamic slanted forms was picked up again in the nineties, as for example in the Educatorium at the University of Utrecht by OMA / Rem Koolhaas & Christophe Cornubert.

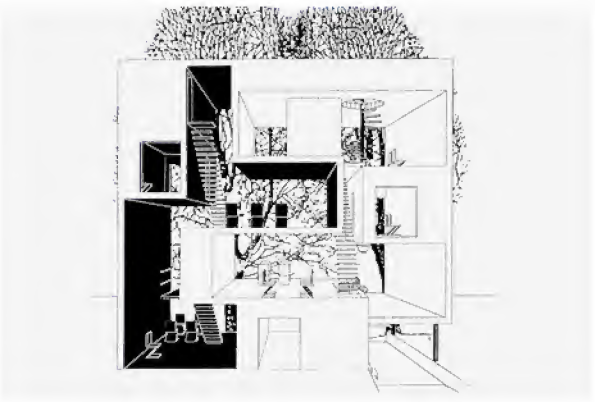
slant

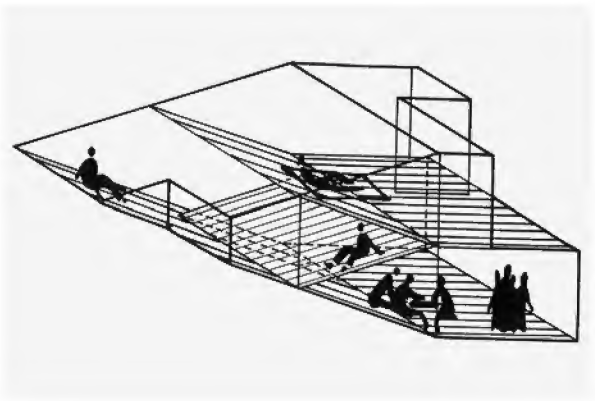
At Osanbashi Pier in Yokohama the architects FOA – Foreign Office Architects (Farshid Moussavi, Alejandro Zaera-Polo) – also attempt to blur conventional hierarchies like the floor, wall, and ceiling.
The neo-avant-garde hoped that it would be able to replace the surplus of meanings of typologies, images, and symbols with a new politics of space. Now for the first time in Yokohama the spatial program of a large public building is committed to the continuous surfaces of topological architecture. [André Bideau in: werk, bauen + wohnen 11/2002]
In order to determine the form of actual on-site conditions for the staging of public space, movement flows were recorded and translated into fields of energy. Effects such as the bearing capacity of the soil, which generate an asymmetrical foundation, are expressed by the architectural cross-section of the building.

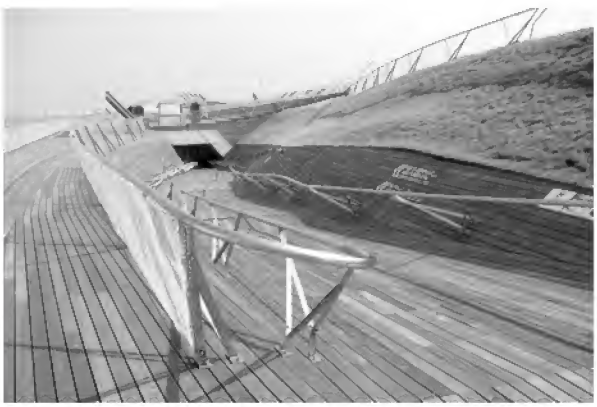
topology

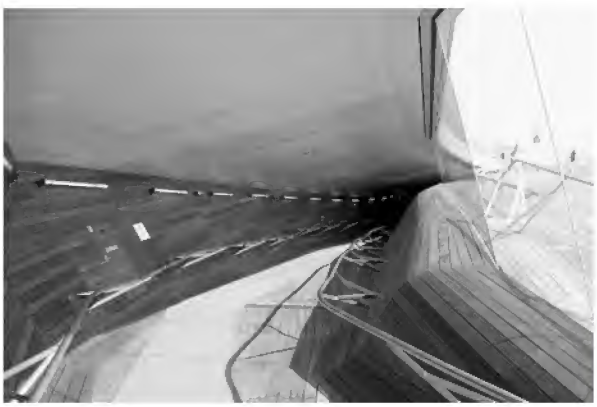












The **Möbius strip** is not just a curved loop but one that also makes a half twist around its longitudinal axis. It serves as a conceptual and metaphorical model for the Möbius House by Ben van Berkel in Het Gooi.
The Möbius loop, the spatial quality of which means that it is present in both plan and section, translates into the interior as a 24-hour cycle of sleeping, working, and living. As the loop turns inside out, the materialization follows these change-overs; glazed details and concrete structural elements swap roles as glazed facades are put in front of the concrete construction, dividing walls are made of glass and furniture such as tables and stairs are made of concrete. [van Berkel & Bos in: Arch+ 146, 16] The house's elongated outlines and its alignment with its surroundings convey the idea of a walk in the countryside (the Kröller-Müller effect) from the interior.

Curved on all Sides

While tension leads to spatial densification, and folding will partially envelop spaces, a plane curved on all sides can produce a cup that contains space. The primary form of the circle or sphere is so dominant that in our minds every uniformly curved plane has the inherent characteristics of a concave and convex side and evokes the position of its center point. Underneath an umbrella's flat curve all vectors are reflected downward. The low geometrical center point generates an imaginary field of energy that encompasses the person holding the umbrella. Although the umbrella's central support displaces the umbrella user and occupies the "prime space" itself, a space is generated around this center. This is contained by the umbrella's spherical cap and projects from the edge of the umbrella to the ground like an imaginary cylindrical curtain. This effect can be witnessed standing under an umbrella during a downpour. The more a ceiling curves around the suggested space, the more strongly we perceive the "space-containing" effect.

Curved reflecting surfaces can concentrate rays of light and be used to cook food in countries with limited supplies of energy. This object was presented at a design exhibition at the Centre Pompidou in 2005.

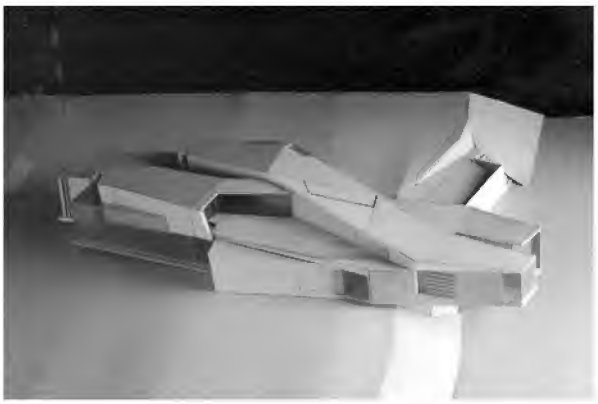
Standing at the center of a sphere or a semi-spherical vault at the point where all spatial vectors are reflected back, one experiences a similar situation and the concentration of forces is perceived as overwhelming.
This is demonstrated by an installation by Mario Merz at the Museum Hamburger Bahnhof, which despite the structure's transparency, still embodies the confinement of a person beneath the glass bell.

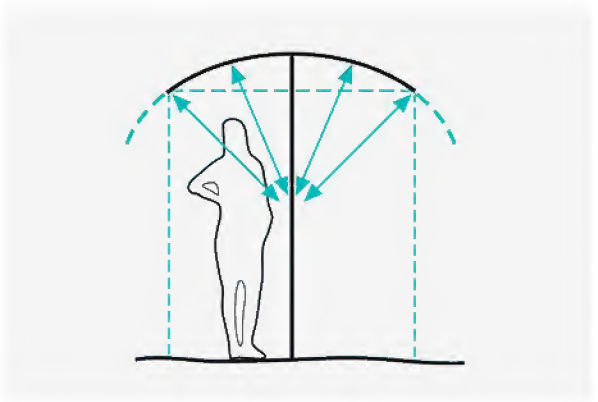
half-sphere

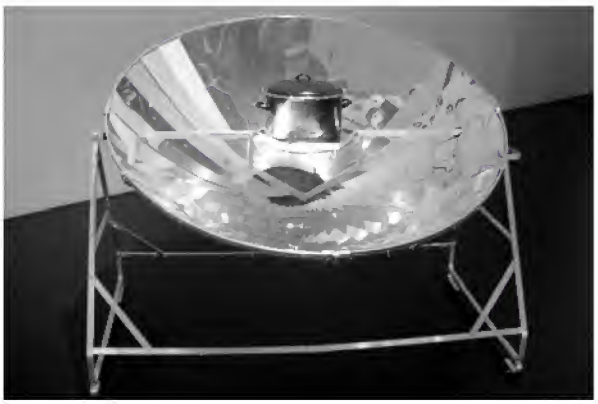
Curves whose center points do not coincide with the center of a space's base plane are more compatible. They extend beyond the center or merge with a wall and in this way "break the tension" of the centralizing space. An oculus at the top of a dome can, in addition to the center point, establish a vertical axis along which forces can orient themselves. Concentration is in this way optically diverted away from the center point toward an endless vertical.

The form of the curve has not only a space-forming effect, but its cupped shape can have a positive impact on its load-bearing function. Here loads are dissipated evenly throughout the thickness of the cup-like shells. The concrete shells were cut like a three-sided segment out of a sphere and assembled as curved T-beams along a backbone to produce the roof for Jørn Utzon's opera house in Sydney. The space beneath it is both contained and aligned.

spatial cup







The Japanese architect Shuhei Endo draws inspiration from a calligraphy style in which the brush is never lifted from the paper. As with our own handwriting a composition is made up of continuous lines. In his design “Springtecture” the corrugated metal sheets, which is subject to constant bending, goes from being floor to wall to ceiling and back again. Unlike the folding used in his studio/house, here the horizontal band dives and twists. The inner surface seamlessly becomes the exterior skin and envelops exterior space, which is transformed into an open interior space. Through **spatial twisting** one can take advantage of the material’s developed stiffness.

looping around

A dome-like form turned over becomes a cup whose lowest or “deepest” point is also the most important point due to gravity. Departing from a spatial center this point can, like the previously mentioned oculus, form a vertical line of energy that pulls infinitely downward.
In objects like a bird’s nest, which tends to be centered, the haphazard linear weave and its permeability counterbalance the absoluteness of the form to convey both safety and peace.

Spatial flexing and weaving can increase the material’s inherent stiffness. Curved strips of paper or plants can become self-supporting objects up to a certain size and have a space-forming effect, as do these woven baskets.

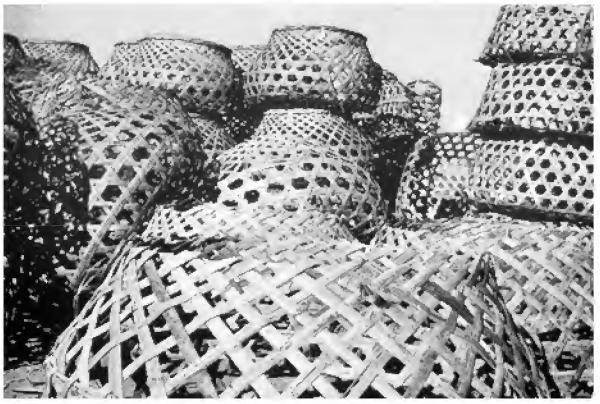
spatial meshwork

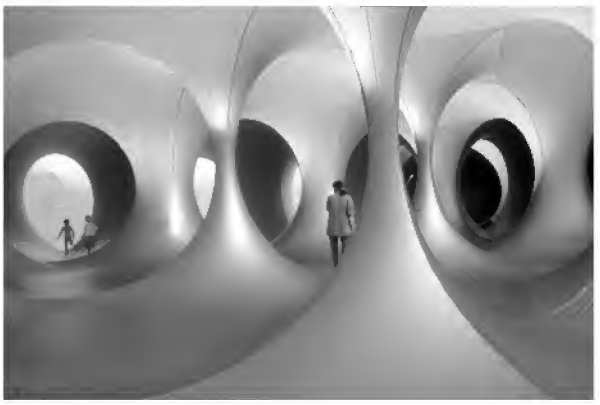
The Mur Island consists of two spirals spatially interwoven like a shell. The structure was built by Vito Acconci in 2003 when Graz was the European Capital of Culture.

The color-space designed by Peter Jones is made of inflatable plastic elements connected at their open edges. An interior space that envelops the visitor is created with flowing transitions between the horizontal and the vertical. The multicolored translucent membrane produces a limitless spatial color continuum.

twofold curve

Beginning with an egg’s shell, Friedrich Kiesler describes the ideal house configuration. This form has the least resistance to outer and inner stress. The flattened forms come to Kiesler out of a kind of spherical matrix. *Streamlining becomes here an organic force as it relates the dynamic equilibrium of body motion within encompassed space. It has more to do with an integral component of complexity than with a pure adaptation of hydro- or aerodynamics.* [Notes on Architecture] – Kiesler calls this function “proprio-spatial dynamics”.
The “endless house” is not amorphous, not a free-for-all form; on the contrary, its construction has strict boundaries according to the extents of one’s living space. Its shape and form are determined by inherent life processes […]. [Notes on Architecture as Sculpture] […] *All our being is conditioned by a consciousness of correalism,* Friedrich Kiesler wrote beneath a drawing in 1937. [Das Archiv des Visionärs]





Space 1|3| Forming Space. The Influence of the Ceiling

The figure of the base plane determines the form of the space and is usually assumed by the ceiling plane. The effect of the figure is recognizable if the floor plane is straightforward. If it is not clearly recognizable or partially covered by built-in units or people, the ceiling plane can help to identify the form of the space. The ceiling may independently influence the space and its dynamics because it is not a priori subject to any functional constraints. It can neutrally reflect the floor plane or through the vertical and spatial design set its own accents.

The pedestal plane and corresponding ceiling slab define a clear space even if it is open on three sides. This sub-space gives the impression of an independent volume in the entry area of the museum of the Biodo-in temple in Uji.

In this building on the Museum Island Hombroich the floor and ceiling are not differentiated from those of the adjacent space, thus Erwin Heerich defines a cylindrical room through the mere erection of curved walls..

Space 1|3|1| Neutral – Parallel – Form-Mirroring Ceiling

In the Water/Glass Guest House in Shizuoka Prefecture an oval plane determines the form of the conference room built by Kengo Kuma. It is carried up to the ceiling through the delimiting transparent walls. In the night view the glass walls are hardly visible and the space is created through the direct dialogue between floor and ceiling, which are conceived as illuminated fields.
The centered and yet directional basic form of an ellipse emphasizes this self-contained space whose unique form is intensified by the diagonal approach. However, this conference room ties itself into the overall spatial complex through the orientation of its main axis parallel to the building's edge and the continuous ceiling.

form mirroring

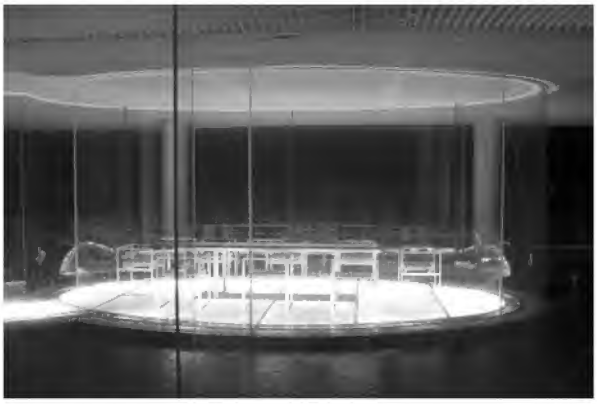
If the ceiling not only assumes the form of the floor plane but also its slant, the form of the room is not affected.
If the dynamics of the given space is already determined by slant and curve, it is thus neutrally reflected by the ceiling as here in the Neanderthal Museum by Günter Zamp-Kelp. The hermetic walls offer no distraction and strengthen the dynamic effect of the slanted planes.

Space is determined through the outer edges of the parallel planes of the floor and ceiling in the River and Rowing Museum in Henley-on-Thames by David Chipperfield. Load-bearing pillars suggest a smaller spatial field within.

plane emphasizing

In a space with parallel floor and ceiling planes where vertical connections are not neutral the field of tension between the floor and ceiling are influenced by the delimiting elements along its sides.
In the N-Museum for local art in Nakahechi in Wakayama Prefecture, designed by Kazuyo Sejima, the form of the horizontal planes is determined by a segment of a circle whose center lies outside the interior space. The closed concave wall also makes reference to this center point, so that the segment of the cylinder seems like an encased part of a much larger exterior space.

In Jun Aoki's bird observatory near Niigata the floor and ceiling follow a space sloped like a ramp. One wall is open and leans outward in order to emphasize the view of the surrounding landscape. Floor, interior wall, and ceiling come together in a C-shaped section. Dynamics along the ramp are accelerated vs. a horizontal view that slows them – an effect that seems both centripetal and delaying.



Space 1|3|2| Directional Ceiling

In the previous examples the influence of vertical delimiting elements is recognizable. The effect of the vertical spatial borders is reinforced if the spatial section has a standing orientation rather than one lying horizontally. In order to counteract this and to be relatively independent of this influence, the superordinate position of the ceiling is used to emphasize the formation of space. I am referring once again to the **anisotropy** of space where the **"above"** assumes a **special position**. Since optical perception tends to be oriented on the vertical, the ceiling has a dominating spatial impact in a three-dimensional composition. Each vertical movement must overcome gravity and involves a special effort. Even the viewing angle from the horizontal demands more effort and involves roughly twice as many eye muscles.

overhead plane

In every directional space there is an imaginary main axis that determines the dynamics of the space. If this main axis is architectonically expressed in the ceiling by spatial design elements, then this orientation dominates the spatial situation, irrespective of further space-forming elements. This is made clear by the open roof structure above the purification fountain of a temple complex in Japan. The simple pitched roof effectively pulls the spatial tension upward.
Though all of the vertical space-bounding elements are open and there are many laterally directed elements, the dominance of the ceiling ridge cannot be weakened either inside or outside. Even where there is a change in the direction of a building, the dynamics of the ridge dominates the spatial situation, guiding us along the shift in orientation despite the absence of walls.

ridge

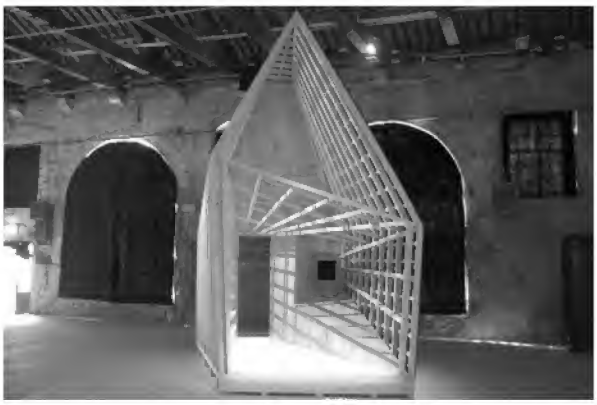
In another building on the Museum Island Hombroich the sculptor Erwin Heerich differentiates sub-spaces in a directional room in which he designs the ceiling with a shed roof that slants in alternating directions. This creates an asymmetrical balance within.
In the central area one tends to face the side of the room with more volume, but the lower side of the room is glazed and affords a view, so both sides vie for power over our perception.

The "Scary House" by Sheila O'Donell and John Tuomey was exhibited at the arsenal in The Irish Pavilion at the Venice Architecture Biennale in 2004. Beginning with simple rural buildings the exhibit abstracts formal and structural principles to create a synthesis of the rural and the urban. The perspective distortion and skewing has a disturbing effect on the visitors' perception, evoking associations and interpretations that nonetheless allow the clear recognition of, for example, a shed, temple, Trojan Horse, or nativity scene.

The influence of the ceiling on the dynamics of a space becomes especially clear when its orientation is perpendicular to the base plane of the space or the object. The interior space of the private home Aura in Tokyo by FOBA (Katsu Umebayashi) is covered by a membrane in a wave-like design, a measure that softens the strongly directional dynamics of this long, narrow space.

Museum Liner in Appenzell by Gigon & Guyer is a directional rectangle upon which a series of shed roofs has been mounted perpendicular to the main direction.

counteracting



The curve of an exhibition space in the Shimosuwa Museum in Nagano by Toyo Ito seems to be clearly supported by the ceiling. The slight sag in the ceiling's section reinforces the pressure on interior space toward the higher side of the room where the spatial volume is greater. This draws the visitor's attention to the display cases on that side and guides them around the outer edge of the curve.

pressing

Le Corbusier's church in Ronchamp is a single-nave asymmetrical complex delimited by concave and convex walls. The convex walls seem to densify space toward the altar area. The floor also points to the altar area with its west-east gradient that follows the natural slope of the landscape. By contrast, the apparently heavy shell-shaped roof rises and is separated from the walls at the southern and eastern sides by slits illuminated by daylight. The ceiling rises toward the south, where light enters through the deep-set windows in the south wall. This produces a concentration and densification toward the altar, while the slits in the wall emphasize the connection to the exterior. At the southern and eastern sides the exterior boundaries are concave and enclose a part of the open space, a gesture enhanced by the cantilever roof. A raised outdoor altar area for large pilgrimage masses projects out above the terrain on the east side. The dark concrete roof is like a large, soft pillow that has a calming effect on the entire complex. Convex walls to the north and west have no projecting roof planes and clearly mark the border between inside and outside.

Kenzo Tange's sports stadium in Tokyo has a hanging roof in which a steel cable construction with a central ceiling ridge gives the space a longitudinal direction. The design produces swooping tent-like sides that arch inward and seem to condense the space. This gives the impression of a cozy and compact space despite its great volume.

hanging

While the inward arching form clearly emphasizes the weight of the load, folds and ridges can strengthen and express the potential for greater spatial capacity.

The Japanese fashion designer Issey Miyake gives his creations tight, pleated folds and ridges, so that in certain positions the outfits take on volume as if they were independent objects. A further example is a detail of the interior space of the Yokohama Terminal by FOA, where the great expanses are spanned by a series of structural folds.
At the Neurosciences Institute in La Jolla the ridges have both structural and acoustic functions.

pleating

Space 1|3|3| Centered Ceiling

With the help of the ceiling it is possible to influence the dynamics of the form set down by the basic plane. The ceiling plane can be taken in at a glance in smaller spaces. We recognize that its shape has a strong impact on the perception of space and orientation. If the ceiling is parallel to the floor, space will be vertically spanned or condensed, but it cannot be contained without space-enclosing walls.
If there is a high point in the ceiling, space will be pulled upward at this point and held in tension. The lantern in the cupola and the intersection of the longitudinal and latitudinal axes of St. Peter's Basilica form an imaginary vertical axis that projects the high point to the floor.

pulling up

A hemispherical interior as an enclosing space embodies the image of the firmament. Even if this is only alluded to, as under a slightly arched umbrella, the space below the concave form is pulled upward.

The opposite effect is achieved at a low point in a bowl-like spatial container. The outer convex appearance displaces space but without providing purchase for the space slipping away.

vaulting

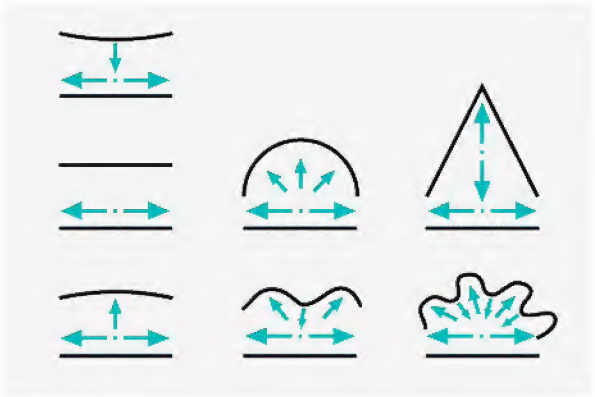
The centering effect can be reinforced by a centered ceiling when the base plane itself is already a centered form like a circle or square. These forms are reserved for special buildings and monuments. As seen from the outside, a half-sphere or dome lends a building an object-like character.
A similar effect is produced by a revolved solid.
The inverted curved ceiling in this cathedral by Oscar Niemeyer in Brasilia (1959), presses the volume of space below it toward an imaginary center point in the floor. A high opening is formed which, analogous to the chimney effect, releases pressure in this densified space and disperses it skyward through the widened mouth above. Here there is no longer a clear vertical axis but a common bundling, centering, and lifting.

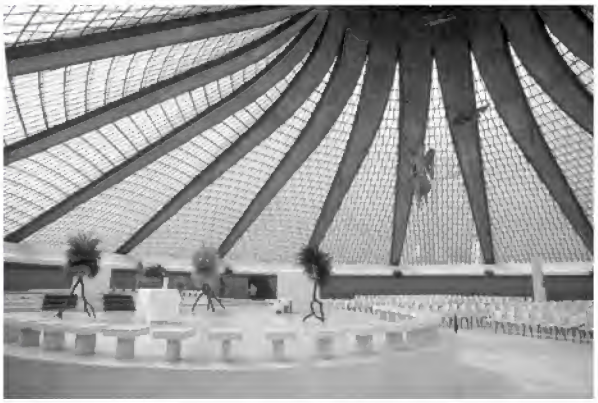
rotating

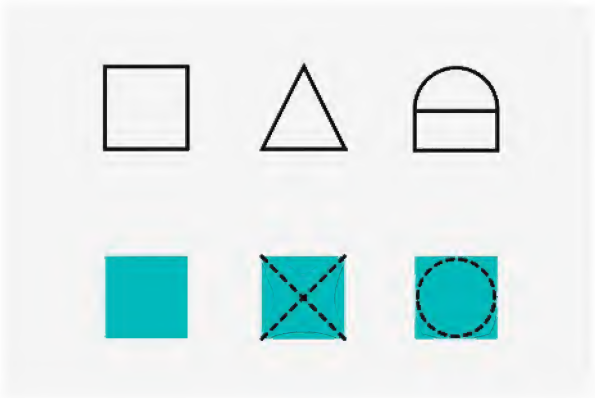
Volumes based on simple, regular figures like the circle and the square whose section and plan views are identical give rise to these absolute spaces. The sphere and the cube are formed from equal units in their three-dimensions. It is also possible to create directional spaces using a top ridge and then center them by means of a high point, like a peak or dome (cone, pyramid, half-dome).

The dome of the Hagia Sophia in Istanbul (532–537 A.D.) was erected above a square formed by four piers. The central space conforms to the longitudinal space of the overall interior of the building. This centering effect is emphasized by the lighting around the base of the dome, which makes the dome appear to hover above the center and lets the high point drift even higher.

centering







As previously described, if the plan and section of a volume are identical, an absolute object or an absolute space results. In our perception these forms are so memorable because their **information content** has been **reduced to the essence**. Nothing more can be taken away without losing the desired message and effect. If an object or form no longer contains redundant information, we speak of a pure form that represents an archetype.
Etienne Boullée designed a monument for Isaac Newton with a spherical interior as the image of the firmament. As with all absolute forms, the question arises as to how and at which point this perfection may be disturbed for an opening or other such feature. A further issue to be resolved is how a sphere shall rest on and be affixed to the ground. In built reality, the sphere rests on the ground enclosed by a cylinder.

archetypes

Centered elements serve to underscore sacred as well as profane sites.
Their high degree of recognizability determined the archetypical forms for the building volumes of the Danish pavilion by Peter Bysted at the EXPO Hannover 2000.

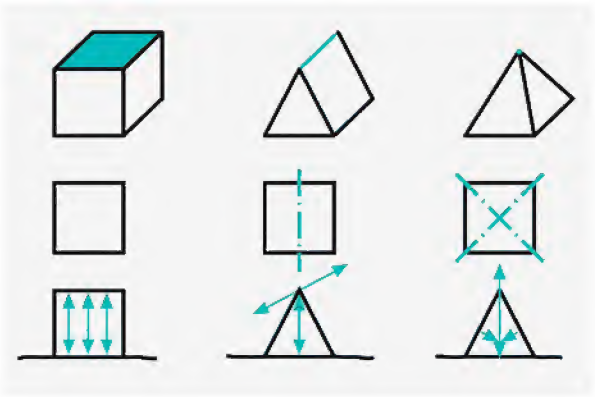
Aldo Rossi defines “analogous architecture” as a series of elemental types (e.g. stable and storage structures) that as referential objects form the basis for his building typology. These building types might be referred to as everyday archetypes.

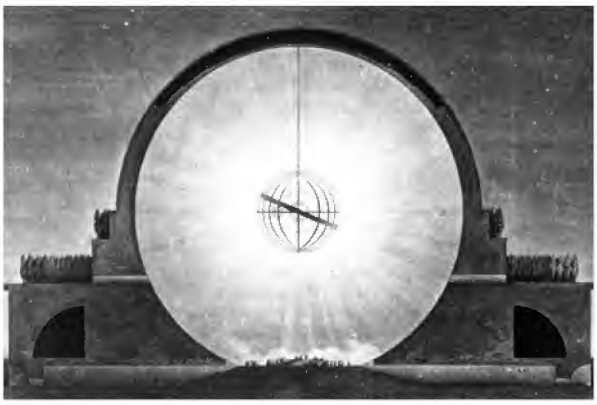
analogies

Space 1|3|4| Ceiling as a Free or Amorphous Form
The ceiling of the Bagsværd Church by Jørn Utzon in Copenhagen undulates above the main space of the church and seems to spread its own melody over the worshipers. The allusion to cloud formations is a further reference to the firmament that is juxtaposed with the flat earth of the floor.
The church looks like an agricultural structure from the outside. On the inside, the 20-meter-wide space is spanned by sculptural reinforced concrete vaults. Kenneth Frampton sees the form of a pagoda-like vault in the longitudinal section, which to him reflects Utzon’s multicultural character. This extends the idea of the sacred beyond the narrow notion of Eurocentric Christianity, giving the space a new kind of atmosphere and lighting quality.
Utzon replaced the overused expression of the individual with the anonymous expression of collective consciousness and that of symbiosis with landscape. [Philip Drew, The Third Generation, 1972, cited in Frampton, GDA, 273]

The interior of this partially underground exhibition hall by Ullmann-Ebner is influenced by the topography of the Heldenberg hill above. Through various inclinations of the ceiling, the architects were able *to compress a gentle definition of places, paths, and transitions into a complex continuum. […] Space doesn’t crack or break away but develops along multi-axial points of reference. In this way, spatial realms are produced that lead from one zone to another, guiding the visitor in a subconscious way.* [Roman Höllbacher, Architektur- und Bauforum 02/05]

Shigeru Ban covers the ceiling of the Japanese pavilion at the EXPO 2000 in Hannover with a meshwork of bamboo rods. This modulates the ceiling, softening the rigidity of the directional space and making its enormous volume more understandable.





Space 1|4| Form-Finding Processes

Ceiling Based on Self-formation Processes

Unambiguous dynamic shapes are generated if the forces themselves are allowed to determine the form. A chain hanging under its own weight from two points assumes a form in which only tensile stresses are exerted. This is called a catenary curve, a form we perceive as natural. If it is inverted like an arched structure, only compressive stresses are at work. Catenary models can be used to represent the thrust lines of arches. These were applied in the Bodegas Güell in Garraf built by Gaudí from 1895–1902. For the construction of La Sagrada Familia in Barcelona by Antoni Gaudí, the anticipated stresses were tested empirically using an inverted model in which the loads were scaled accordingly and applied using small sandbags. Flexible, slender chains represented the arches as a complex system and assumed their forms according to the loads. The **organizational phase** here is **material** not immaterial.

finite elements

The method of the "reverse path" lets us recognize formation processes in inanimate and animate nature by artificially initiating these processes. […] The original biological construction is the fiber-reinforced soft pneumatic structure. [Otto/Rasch, Gestalt finden, 45]

At the Institute for Lightweight Structures (IL) Frei Otto experimented with self-formation processes, generating various forms (soap film models) that always contract to the smallest surface possible for studying **minimal surfaces** and the analogous development of membrane constructions.

For the German Pavilion at the EXPO 1967 in Montreal (design Büro Rolf Gutbrod/Frei Otto) Otto erected an experimental structure spanning an area of 460 m2 to study the assembly processes. It was a cable-net structure formed by two saddle-shaped surfaces. At the center was a big "eye" covered by a third cable-net membrane. Later, it was turned into an institute building and given solid, insulated walls. The "eye" was left transparent and covered by perspex panels. Today it still serves as the headquarters of the Institute for Lightweight Structures and Conceptual Design (ILEK) in Stuttgart.

In 1967 Behnisch & Partner, Frei Otto, and Leonhardt & Andrä won the competition for the roof of the main stadium in Munich's Olympic Park with a concept whose dynamically modulated landscape extended into the roof construction itself. After detailed feasibility discussions Frei Otto came up with the solution. He drew on his Montreal experiences to build the Olympic stadium roof as a cable-net structure (1968–72). The surfaces were divided into numerous saddle-shaped curved nets. The structure's forces were collected with perimeter cables. These cables were then interconnected between roof sections and braced with externally located masts. The Olympia Baugesellschaft and the politicians responsible showed commendable courage for forging ahead despite the uncertainty of several unresolved issues. From Frei Otto's point of view, however, the *notion of lightweight structures developed for the purpose of cutting back on material in architecture […] has forgotten its humble origins and gotten out of control.* [IL 14, 1975, 14]

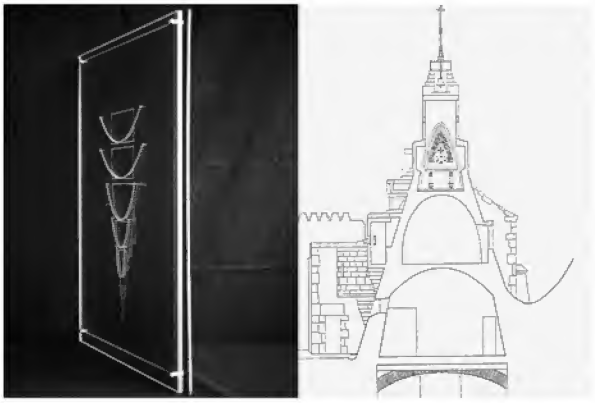
cable-net structure

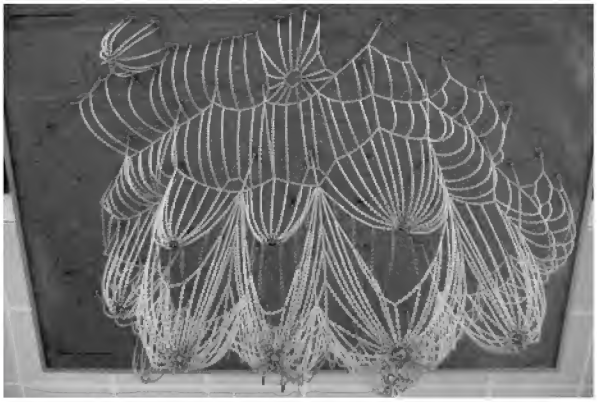
Simulation Processes

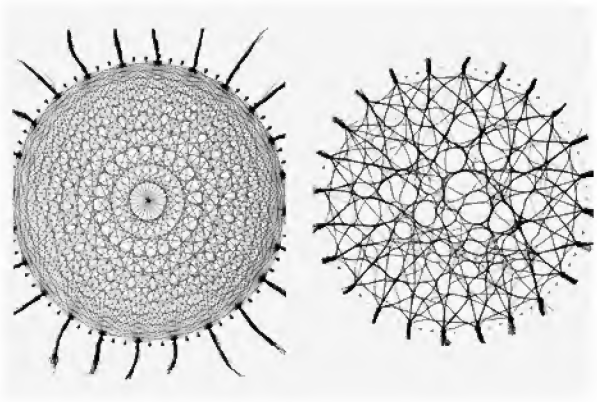
In the experiment series "Direktwegenetz" [web of direct paths] multiple points were connected using wool yarn. After submerging the web in water, surface tension and the set lengths of yarn produced a minimized indirect network [cf. Otto/Rasch, Gestalt finden, 68f; model at the IL by Marek Kolodziejczyk] Gaudí and Otto found that the the same load always produced the same ideal catenary curves. However, with wool yarn in water, the results differ.

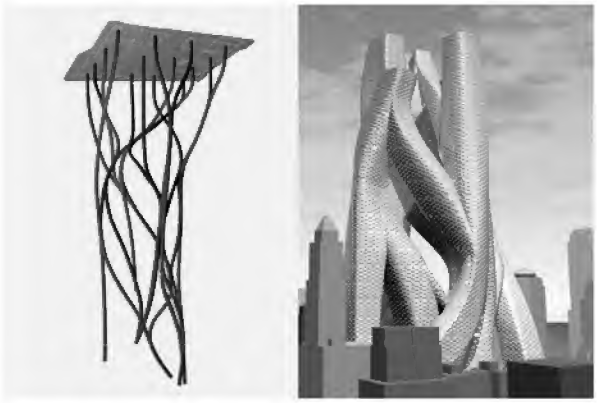
Lars Spuybroek of NOX adopted a variation of Frei Otto's yarn technique in his design for the World Trade Center. To represent the main circulation zones, strands of wool yarn were inverted and submerged. When removed from the water, *the strands all fell into place in a complex network (with the cohesive lateral pull of the water being added to the force of gravity.)* [NOX, 260]

vague and inexact









The design for the BMW pavilion by ABB Architekten for the International Automobile Fair in Frankfurt follows the **biological approach** to finding form in its attempt to capture the instant in which two drops of water merge into one. To express the precarious balance between inner pressure and surface tension, a program is used that simulates these forces based on the laws of physics. Bollinger + Grohmann realize the plan *with the help of finite elements and frameworks software. […] The drop form was broken down into its three main directions using regular sections, then the primary structure was translated into a two-pod, curved, asymmetrical shell using aluminum ribs.* [Bernhard Franken in Arch+ 148, 72]
The seed forms of various fruits inspire Itsuku Hasegawa in her design of the outer skin of the Fruit Museum in Yamanashi Prefecture. The volume was then generated from a revolved seed form.
In both these cases the outer skin is separate from the interior objects or spatial volumes and thus is also perceptible as the same form from the inside.

analogous

The Kunsthaus in Graz by Peter Cook and Colin Fournier is a blob-like form of two interacting bubbles. The three-dimensional modeling was accomplished using a "volume generation" method. A net of "gravitational points" was stretched around a spherical model. By pulling at these points, the desired form was achieved in a kind of "sculptural process".
A structural shell construction was developed in close collaboration with Bollinger + Grohmann. The exterior surface is articulated by the pattern of intersecting lines of this structure.
Unlike in the previous examples, an extant building is incorporated into the new structure and the urban situation is consciously densified. However, inside the building, because it is divided into several floors, the impression of the volume as a whole is lost. Just the upper level follows the building's amorphous form. One cannot see into the building through the multilayer skin, but the enveloping media façade lets the "Friendly Alien" come to life at night.

biomorphic

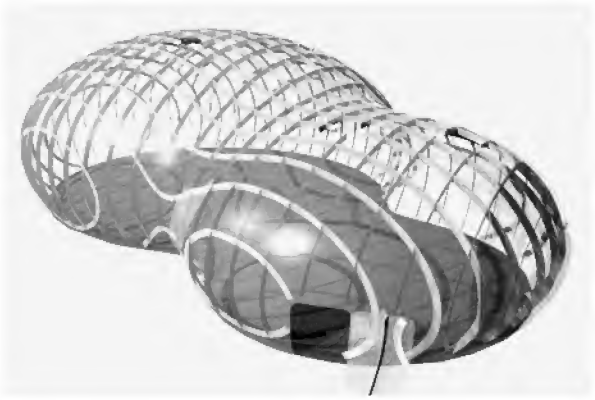
For Frank Gehry the form of the fish perfectly exemplifies motion. With this in mind, he developed the curved glazed roof above the atrium of the DZ Bank in Berlin and the walk-in sculpture in the middle of the building. The idea was to coordinate exterior form, construction, and interior space as much as possible. Gehry gives priority to articulation of gesture rather than the construction of physical borders in his designs. The dynamics of the form that he aspires to create is expressed in his sketches. The absorption of movement and energetic whirls at certain places leads to synergies of dynamic forces. In numerous study models we see that the aim of his experiments is to bring all moving parts together in a state of harmonious interaction and potential balance. Optimization and adjustment of these forms to the production process is achieved with the help of the computer program CATIA. A constant issue is the implementation of multiple layers, in which the exterior form is sometimes only a decorative skin.
A second example is the Disney Concert Hall in Los Angeles where, in the music hall itself, the outer form is not perceptible.

gestural

Computer-Generated Form Finding

In 1929 Paul Schatz developed a method for the mathematically defined transition from rigid volumes to dynamic forms. The connecting bridge at the Royal Ballet School in London is a design referencing this method. This walkway, planned by Wilkinson Eyre Architects, was inspired by the movement of a dancer. It connects two extant buildings at differing heights. The form is based upon the rotation of a square frame in three-degree increments along the connecting course. The height difference is overcome by slightly raising the frame with each rotation. Inserted between the frames are partly transparent, partly opaque glass panels, which emphasize the lightness of the construction.

twisted



Materialization of the Context

For centuries traditional architectonic forms have been determined by the size and direction of forces and the transference of these to the existing materials. These forces at work generated the “dynamics” of the space. Over the time historical-cultural interrelationships and inherent meanings developed with these forms and spaces.
In the current architectural debate attempts are being made to turn this process around. **Traces and motion diagrams** are being used to shape matter and space. With the help of computer programs and their potentials for calculation and visualization we can give form to volume. The program information and **organizational phase** is primarily **immaterial** in this case. The vectors representing external forces shape the new architecture.
Excerpts of a study by Angela Lempelius show the simulation of the “motion/utilization/perception space” based on an analysis of her own bathroom.

diagrammatic

Lempelius documents the personal space through motion studies and represents it in vertical sections as well as three-dimensionally in abstract spatial form (top right). The patterns of motion and their frequency generate the notion of a new room shape that can be seen as a reverse imprint of her daily routine.
To Lars Spuybroek, the Sono-O-House is a project that makes reference to inhabitation and the body motions of the occupants. In a series of experiments a range of physical movements is transformed through paper strips into a spatial model. The finished artwork between Son en Breugel and Eindhoven is located in an industrial park and serves as a casual meeting place and hangout.

processual

Peter Eisenman rejects the principle of interpreting architectural symbols and places in terms of the generally accepted historical-cultural approach. He attempts to derive form-generating parameters from motion and force fields using computer programs.

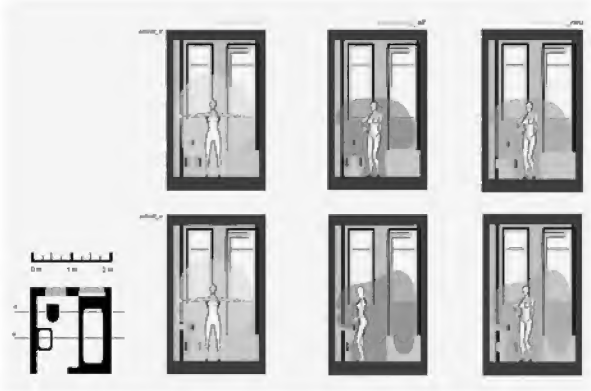
Form Finding through Interferences

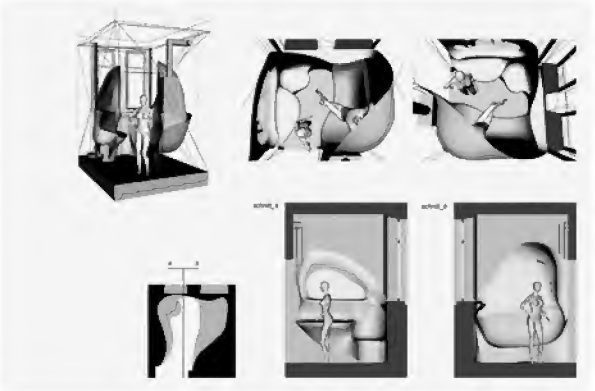
In his early works Eisenman overlaps different grids, making them openly visible in his buildings, e.g. at the Wexner Center. A fragment was shown at the MAK in Vienna in 2005. In his design for Santiago de Compostela he focuses his interest on **geometric transformation processes**. Computer-generated sequences produce waves, folds, and topographic deformations. His technique of “morphing” transforms two neighboring structures into a “supple” form with minimal resistance. “Mapping” (l.) overlaps the medieval textures of the old part of town, the Cartesian coordinate system, and the topological surface of the original site. In this way Eisenman also integrates time into a series of forces.

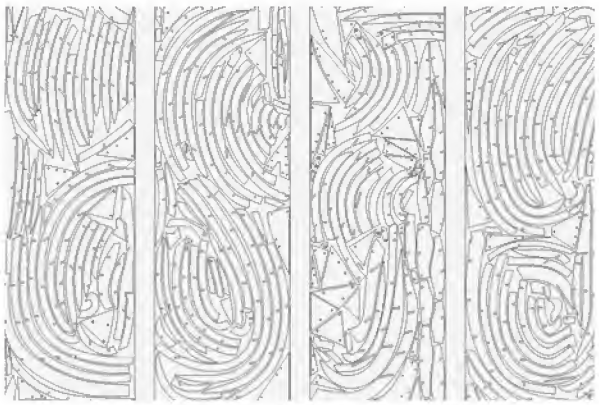
simultaneity

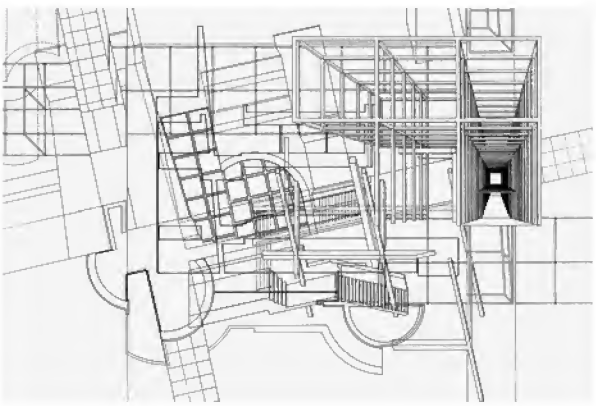
Movement Mapping

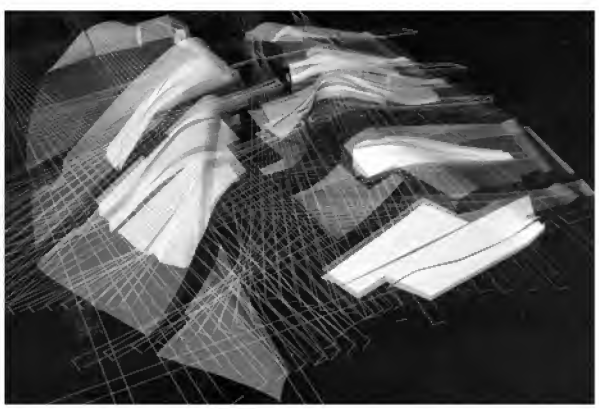
Blob (Binary Large Object) software independently generates forms through the force of “attractors”, like water that tends toward the path of least resistance. Greg Lynn analyzed a context and attempted to infer selected data as the mobile forces of that place and to apply them as form-defining design parameters. The fluctuating forces were represented through “movement mapping” and captured in stills taken of the process (r.). A still was selected and materialized into a building, e.g. Embryological Housing. [cf. Andreas Ruby, werk, bauen + wohnen, 11/2002]
The search for form based on the flows of motion and other external influences is transferred to a seemingly calculable and quantifiable medium. Freezing fluctuating states produces a space cut off from the sequence of motions. From this resulting space one no longer recognizes the preceding motion and it seems restrictive. The parameters seem hierarchically random. This results in space capsules that can provide their own answers to a given situation, but as to the superordinate criteria and the position of the designer, there are still questions that need to be posed and answered.

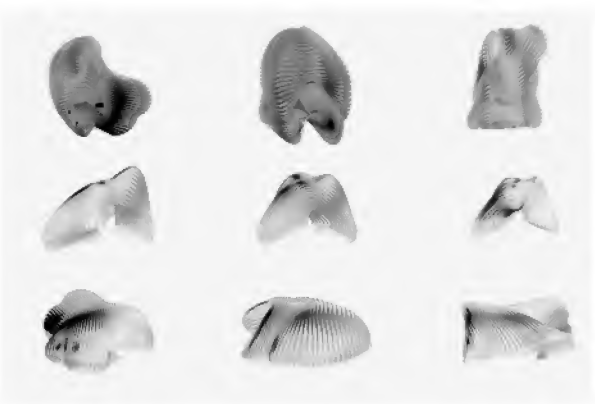












Space 2| Space and its Surroundings. Spatial Definition through Boundaries

To Martin Heidegger space is not just determined by body participation. It is also defined from a distance as the enclosed realm that fills in its boundaries. *A boundary is not that at which something stops but […] that from which something begins its presencing.* [Heidegger, Bauen, Wohnen, Denken, 155]

The notion that space is defined by its boundaries and their manifestations has accompanied us throughout this book. Based on their forms, **point-elements**, **linear**, and **planar elements** define the character and dynamics of a space. Each of these space-forming elements defines a certain kind of border, which in turn characterizes the element's relation to its surroundings.

In their installation Blur, Diller and Scoffidio wanted to create space while minimizing its definition through an artificial cloud of water vapor. Still, they had to give form to the required matter. Their choice of the oval form for the steel mesh walkways combines the dynamics of centering and expansion. The vertical borders were reduced to a minimum.

Space 2|1| Filtering (through Point-Elements)

Homogeneous point-elements mark the edge of a plane without preventing a connection to its surroundings. The position and height of the elements create a spatial field and their form indicates where the field belongs and how it connects to its surroundings.

In a Pompeian house round columns arranged close together enclose a rectangular atrium. The simple geometrical figure of the courtyard and the height of the columns define a clearly recognizable exterior space within the building. The rounded shafts of the columns underscore their filtering function and the circulation of air.

In "Stangenwald" [Pole Forest] on Killesberg, Stuttgart, by the artist Hans Dieter Schaal stone columns grow out of intersection points in a geometric grid and filter the defined area within the vast grounds of the park.

mediating boundaries

The positioning of homogeneous point-elements defines a plane between their base points. The vertical extention of the point-elements into columns produces a spatial field. Conversely, the definition of the plane is a prerequisite for the definition of a space. The placement of vertical elements along the border spatially emphasizes this basic figure.

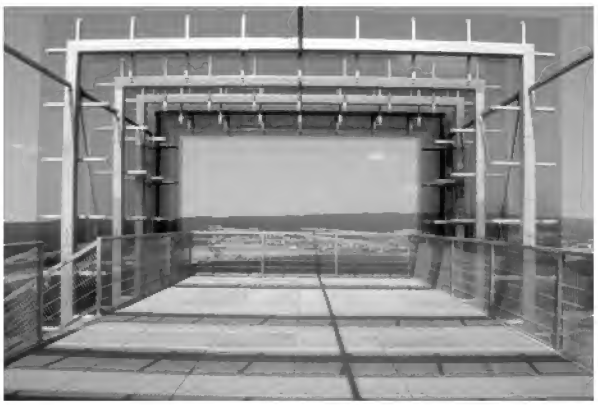
Using cardboard pillars along the periphery of an ellipse, Shigeru Ban forms a permeable spatial filter for worshipers on the entrance side of his church in Kobe. Along the back wall the spaces in between have been almost eliminated, forming a concave wall of densely positioned pillars that provides the necessary stability for a sanctuary. Thus the longitudinal axis of the ellipse divides the space-bordering elements into mediating and separating halves.

filtering space

"Millennium View" by Günter Zamp-Kelp is an installation built as a stairway structure above an abandoned rock quarry as part of the EXPO 2000 in Steinbergen near Hannover. Rectangular glass frames create a directional space perpendicular to the direction of the ascent, opening out onto the landscape on two sides. Panes of glass positioned at irregular intervals create spaces of varying densification with some views directed straight ahead and some filtered from the side.

A series of roughly 1,000 toriis guides the visitor of the Fushimi Inari-Taisha shrine. These frames, positioned at irregular intervals, create a long row leading up the mountain and make perceptible the distance through divisions with compressed and extended rhythms. Worshipers sense a connection with the surrounding woods, yet are also focused on the path and their goal in the distance.

guiding space



Space 2|2| Dividing (through Linear Elements)
The basic function of linear elements in the form of walls is to partition or hermetically separate space. They follow a movement that continues along a course until arriving at a possible crossing.

The outward-leaning wall slabs at the Neurosciences Institute in La Jolla divide the artificial terrain. Being open at the top they reinforce the relationship of this area to the overall grounds. Leading to the lecture hall is a cube-shaped foyer. The opening in one of its corners releases the dynamics of the spatial diagonals, which sends out a strong connecting signal to the exterior space.

Casa San Cristóbal by Luis Barragán is divided by oversized wall slabs. They have an object-like character that arises from their size and color. Despite the large openings they function as independent linear elements that divide the grounds into clearly recognizable spatial sequences.

dividing space

The duplication of linear elements creates a directional space with a clear beginning and end. [See chap. Line 3|1| Duplication] A ceiling in barrel form reinforces the orientation and allows a kind of tunnel to form. The dynamics of the walking direction is determined by the main or central axis. Through lateral openings a cross-dynamics is produced, which disrupts the sense of entrapment.

Various relationships to the surroundings are created depending on the design of the boundaries. These can be intensified or moderated through the form of the bounding elements. Lateral openings create a cross-dynamics that lessens the force of the main direction of the corridor. The orientation of the wall slabs in the Palace of Winds in Jaipur or the columns in Fatehpur Sikri reinforce the relationship to the adjacent area.

mediating space

Space 2|3| Zoning (with Planar Elements)
The reduction of room height leads to a densification in the vertical direction and an increase in spatial intensity. In the Japanese home the floor is given special attention and zoned for different uses. Here the raised platform distinguishes a special place.

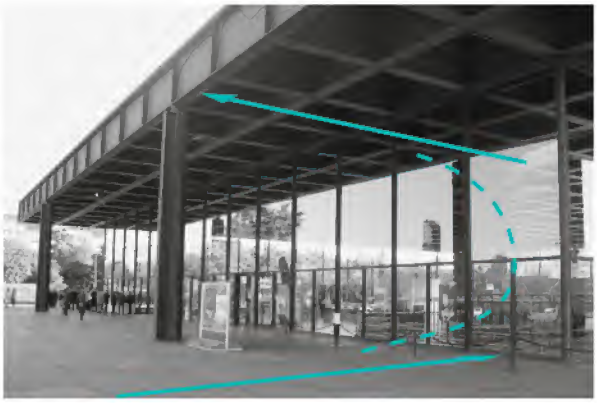
The courtyard of the Museo Nacional de Antropología in Mexico City is covered by an extremely cantilevered concrete umbrella that projects at a height slightly above the surrounding buildings. The roof slab finds no direct resonance with the ground and due to its height cannot necessarily be considered space-forming. Yet by virtue of its strong presence and provision of shade, it indirectly contributes to the perception of space.

zoning space

At Kengo Kuma's Water/Glass Guest House near Yokohama a spatial layer similar to the "engawa" between the cantilever ceiling and the water surface of the floor is formed as a transition to the exterior space. At the same time the floor's water surface connects with the water of the harbor in the distance, making it seem as if the building were standing in the water. A series of round pillars stand outside a glazed wall that climatically encloses the interior space. These pillars mark a further spatial layer encircling the interior volume.

The Neue Nationalgalerie in Berlin by Mies van der Rohe works with similar elements. The interior space is glazed, while the roof is extended far past the exterior wall. The placement of the pillars, however, carries the building to the outer edge of the roof. This stakes the building's claim on the spatial zone below the roof. The exterior ground surface, however, stretches to the glazed wall of the building and continues inside, thus implying that the perimeter zone belongs to the exterior space.

spanning space



The Phenomenon of the Cantilever

Cantilevered planes are especially effective for zoning because of the hierarchy of "the above". They extend out into space where they distinguish the covered area from the overall space. Even without being reflected on the ground a densified zone is created which belongs to the object that gives rise to the cantilevered element.

In the example of the dancer Palucca, Kandinsky demonstrates how the "free" leap departs from the linear form of dancing steps and extends into space – as opposed to classical dance where the leaping movement itself forms a straight vertical. The effect of the spread limbs extends far beyond the body of the dancer. [Cf. PLP 42]

In his Stäbetanz [Stick Dance] Oskar Schlemmer extends the limbs of the dancer emphasizing the effect of movement beyond the body. The reaching out of the sticks into abstract space intensifies the energy of motion of the dance.

extending

An overhead cantilevered plane is used to occupy space in diverse ways. For example in a small après-ski bar in St. Anton/Arlberg by Wolfgang Pöschl, the closed cube gives the impression of a compact volume.

When the bar is open the panels are raised to form cantilevered planes around the object, a zone in the exterior space is defined that temporarily becomes part of it. The ground surface remains unchanged and also remains part of the the exterior surroundings. In this way the exterior space is specified without creating a threshold that must be overcome in order to step up to the bar.

cantilevering

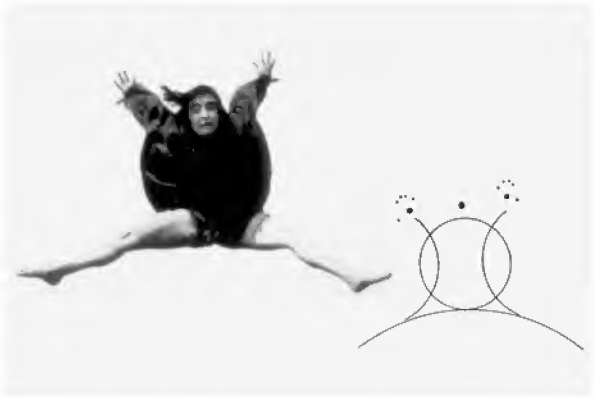
Transfer Spaces. Transfer Areas

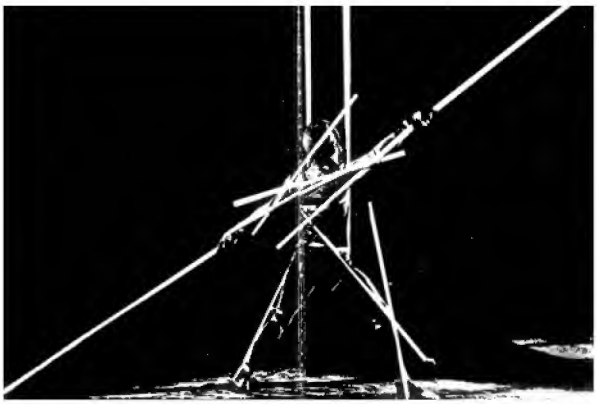
Spatial densification may be designed to create filter-like areas of varying intensities which act as **mediators**, **threshold areas**, or **accentuation**.

Threshold areas as demarcation lines can also be alluded to by abstract symbols, e.g. banners or braids. Here awareness plays a key role – the observer must be familiar with the given culture or be able to learn how to read and understand the symbols.
The entrance building outside this Japanese temple is charged by the tension between the floor and ceiling planes and serves as a spatial filter and threshold area. Open on all sides it welcomes the visitor, but the platform raised above ground level makes it clear that one is entering a new realm.

The Schaulager Museum in Basel designed by Herzog & de Meuron with its indented façade forms a frame around the entrance which features a threshold structure conceived as a variation on the quintessential "house with roof". The offset doorways and the change in direction of the path through the building reinforce the effect of this transfer area.

transfer spaces






Cafe
RESTAURANT


Cafe

Space 2|4| Spatial Body – Spatial Field

In the classic form of the Greek temple, called a peripteros, a series of columns encircles the closed space. This can – as in Vienna's Volksgarten in the Theseustempel – be seen as a filter around the closed **spatial volume** of the temple (smaller reproduction of a Greek temple). This spatial filter serves as a mediating layer that brings the special importance of the original sanctuary into a relationship that ties it into its surroundings while avoiding direct contact between the mundane world and the sacred walls.

Arcades and covered walks with their non-continuous façades form a filtering space as in this courtyard surrounded by open galleries in Mallorca. Depending on design, this transition zone is either ascribed to the interior or exterior space. Here, the courtyard pavement extends beneath the shady arcades and up to the walls of the building. In many cloisters, parapets add to the introverted impression of the arcades, ascribing them unmistakably to the building and the enclosure of the garden.

spatial filter

The forest chapel at the Woodland Cemetery built by Gunnar Asplund near Stockholm in 1919 lets the surrounding forest act as a filter. In the built area twelve wooden Doric columns form a kind of portico that plays with the theme of a transition from the trunks of living trees to inanimate columns.

Permeable walkways constitute independent structures that as spatial filters define individual areas and divide the vast summer palace in Beijing into zones. These also create protective spatial fields around the actual residential and temple buildings.
The intention of ordered guidance becomes clear here, even if the covered, shady corridors are designed as light and permeable structures.

spatial field

The combination of horizontal and vertical elements results in an individual space that appears to be a solid volume. Even if there is no ceiling, the space seems enclosed.

Despite variations in construction – some open at the top, others on the side – glazed surfaces in a vacation home by the Japanese architect Ryue Nishizawa enclose different green spaces like display cases, making them visually equal to the interior room sequences and a mediator between architecture and nature.

In addition to the glazed surfaces, a series of load-bearing supports defines an exterior space within the Kunsthaus in Aarau by Herzog & de Meuron. This inner courtyard is partially covered by a cantilevered plane as protection from the sun, which also adds to the enclosed quality of this strongly introverted exterior space.

spatial container

Perceived from the inside a closed space serves both physically and phenomenologically as a protective shell. From the outside it seems exclusionary and occupies or displaces part of the overall space. For his portable office Hans Hollein deve - loped a transparent synthetic bubble that forms a protective spatial volume and can be set up anywhere (Mobile Office, 1969). Beneath the city railway tracks and sandwiched between the two directions of the busy outer ring road in Vienna the Austrian media artist VALIE EXPORT isolated a volume from its noisy and polluted environment. This completely rectangular glass box interacts visually with the surrounding space but is physically closed off and acts as an autonomous object. It appears both transparent and reflective, which enhances the ambiguous character of this glazed spatial volume.

These previous examples deal with the addition of spaces in various combinations. The following section addresses some systematic approaches.

spatial volume

Space 3| Spatial Sequences. Addition of Spaces

Spaces and spatial volumes always exist in an environment with which they must interact. Since single spaces usually just arise in archetypical situations, most buildings consist of a combination of several spaces of multiple spatial types. There are many possible ordering structures for organizing spaces. For example, Jörg Kurt Grütter differentiates between **space within space**, **sequences of spaces**, **hierarchies of spaces**, and **spatial penetration**.

Space 3|1| Horizontal Spatial Sequences

Space 3|1|1| Space within Space

The space within a space depends on the volume surrounding it and has no direct connection to the exterior. [Grütter, Ästhetik der Architektur, 109; see also illustrations next to it] The principle of **space within space** or the building within a building can be found, among other places, in Christian sacred buildings. The bronze baldachin above the High Altar in St. Peter's Basilica is one such space.

The German theorist Jürgen Joedicke distinguishes between two types of space based on the kind of spatial boundary: the **spatial field** is alluded to by fragments (basic elements) and the **spatial container** is enclosed by continuous walls. According to Joedicke, both these fundamental types in architecture have occurred as interconnected elements from the beginning. The image of the god in the temple complex of Medinet Habu is marked off by four columns within an enclosed continuum – a spatial field within a spatial container. [Cf. Joedicke, Raum und Form in der Architektur, 106]

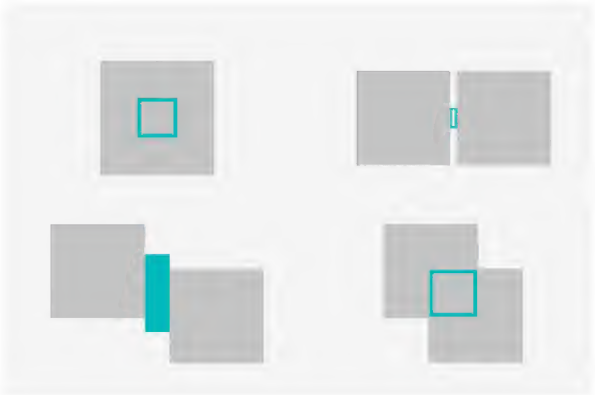
The Ise Shrine complex, holiest site of the Shinto religion, lies in a vast park grounds in which there are a number of individual shrines distributed throughout. There seems to be no visible ordering principle nor any apparent axial relation among the structures, but there is a recognizable order in the arrangement of the shrine buildings. In the innermost shrine, called Naiku, there is a covered bronze mirror said to have been brought here by the Goddess Amaterasu and never looked upon by anyone since. Only chosen priests and the emperor have access to this area.

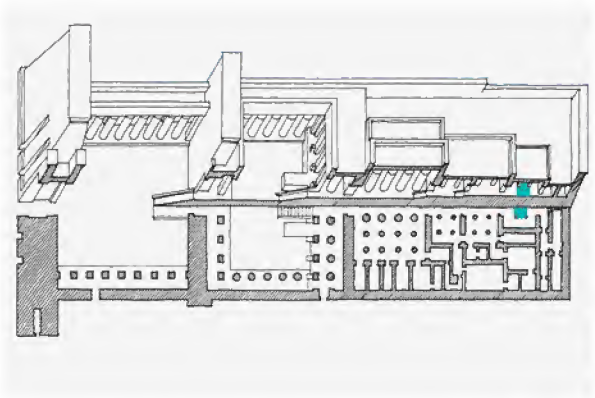
The Ise Shrine is bordered by several linear elements in the form of simple wooden fences. The direct route is shielded by a freestanding wall, the upper half of the outer main gate consists of cloth that gives a glimpse inside when the wind blows. Thus there are several spatial layers that provide physical and implied protection to the shrine within, and at the same time conjure up in the mind of the visitor a vague image of the area that is off limits. In addition to the physical delimited space, a **mythical space** is created, which is charged by history and rituals.

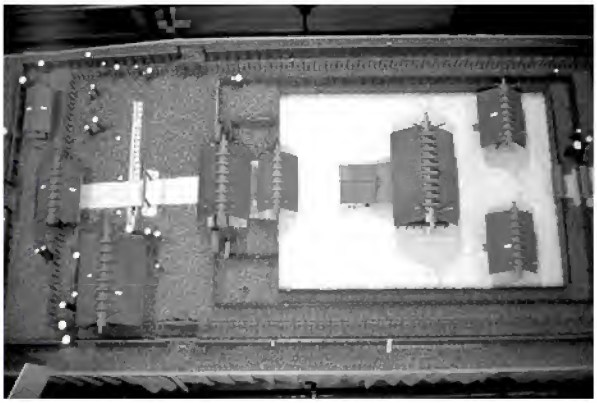
sacred

The Mark Taper Forum in Los Angeles represents a secular manifestation of the space within space concept being surrounded by a double row of supports. A roof structure supported by the pillars creates a covered walk that is a spatial filter that encloses the cultural center and underscores its special importance. The square pillars assume the two main directions of this framing structure in their dynamic axes: the orientation along its exterior edges emphasizes the overall form of the object, while the transverse axis stresses its permeability. The proportions of the covered walk are in clear contrast to human scale and in their enormous height raise the building in the hierarchy levels of urban space, allowing them to stand out in the surroundings as a space-forming structure. The ground surface, at the pedestrian zone, differs only slightly from its surroundings so as not to interrupt the sequence of the vast urban space, opera house, and cultural center for the public.

profane







Space 3|1|2| Sequences of Space

Less complicated are disengaged spaces that are united by simple addition. The most straightforward design is a single and direct point of entry and exit.
If there are several points of entry, access follows the same principles of movement demonstrated with point-elements and linear elements and their dynamics.
Depending on the arrangement, the result is either a form of circulation or a linear sequence similar to an enfilade.

Even in a simple one-room house, the occupants modify the surroundings to provide additional space and extend the boundaries of the house. One way is to build differentiated spatial layers as in this simple hut in Thailand.

linear

If it is possible to go from one room to the next, and if the doors connecting these walk-through rooms are aligned along an axis, they can take the form an enfilade, as is the case at the Fridericianum in Kassel. The strict linear sequence of the rooms was challenged by Haus-Rucker-Co (Günter Zamp-Kelp, Laurids Ortner, Klaus Pinter) at the documenta 5 in Kassel in 1972 with the installation “Oase No. 7” which experiments with a bubble out the window of a room in such a linear sequence.

In the Gründerzeit apartments built in Vienna during the second half of the nineteenth century **linear** and **circulating principles** were often combined. Double doors connect the main rooms along the street to a long sequence of spaces while the occupant can circulate through the entire apartment via jib doors. These lead to side rooms such as the kitchen and bathroom and let adjacent rooms retain their autonomy. (Apartment house at 10 Stadiongasse, designed by Otto Wagner)

Space 3|1|3| Hierarchies of Space

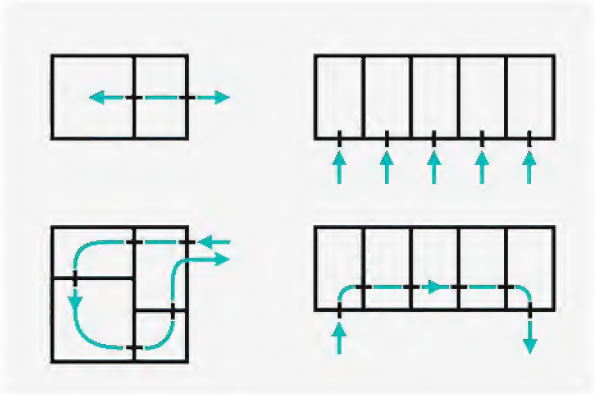
Based on the hierarchical ordering principle, rooms are not connected directly but are accessed via space that is either subordinate or dominant. The individual rooms can be entered independently of each other. Thus hierarchies materialize depending on the spatial organization and functions, producing different zones of respite and circulation and clearly interpretable structures.

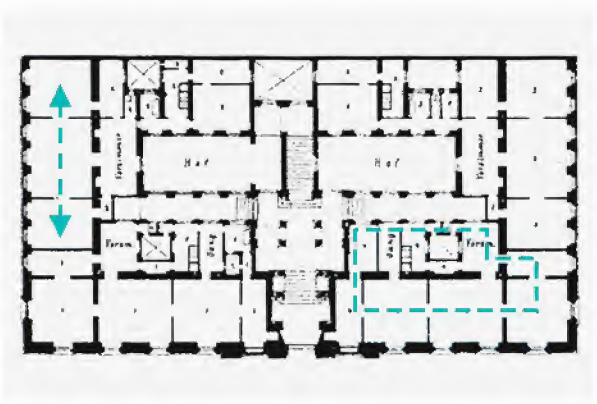
The units in the apartment complex by Alvaro Siza can be entered directly on the ground floor and via a covered walkway.

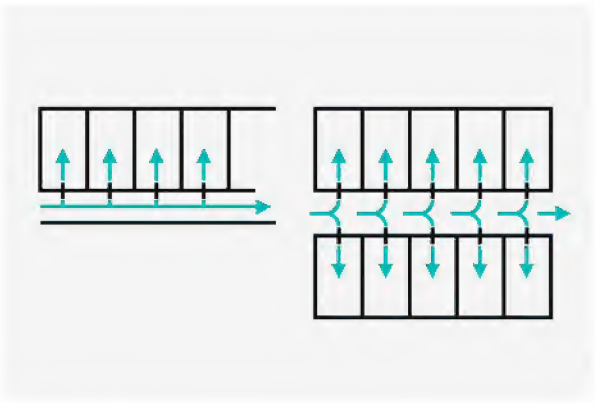
hierarchical

Linear organizations should have an articulated beginning and end. Transition areas should be able to accommodate different paces. Along the corridors their threshold or entry areas should offer enough space to change directions and tie into the main flow of circulation. This is the case in the covered walkway of “In der Wiesen”, the mixed-generation apartment complex in the south of Vienna (by Ullmann-Ebner).
In the organization of large-scale or urban spaces, hierarchical spatial sequences are especially important in terms of orientation and belonging. Here for example we see the courtyard between the forecourt and the green zone.

ordering







The composition of architectonic elements and the sequence of differently orientated spaces can influence the visitor's pace or attract the visitor's attention. Composition also expresses the various relations to the surroundings and those among the spaces themselves. For example in the Pantheon in Rome, certain elements reveal different functions: the sequence of steps (delay), columns of the porch (filter), low door (narrow/tight), and vaulted dome (wide/vast). [See chap. Point 2|3| Transformation from Non-Directional to Directional]

Under Mussolini the Baroque ensemble of St. Peter's Square was disrupted by the construction of the monumental axis of the Via della Conciliazione. In doing so, the obelisk that previously dominated the square was demoted through perspectival effects to a minor reference point. The lateral axis of the square underscored by the fountain transforms the directional force of the current axis into a planar expansion and plays down the direct orientation toward the Basilica.

staging

Space 3|1|4| Open Floor Plan (Horizontal)

The expectations for the private living space and home have changed over the centuries from a hierarchical order and longing for orientation and anchoring, to an open space with planar expansion that allows spaces to flow **freely** around a **symbolic center**.
Frank Lloyd Wright's Prairie Houses as well as Fallingwater were built around the fireplace as the traditional center point with a continuous flow of space around it.

Mies van der Rohe and Le Corbusier took the idea of the open floor plan, **plan libre**, a step further. Linear elements like walls serve here mainly to partition space. Supports such as point-elements are employed for load-bearing purposes, whereby their positioning plays a role in the zoning of spatial areas. Thus the Tugendhat House offers a range of dynamic and stationary areas without interrupting the overall flow.

spatial flow

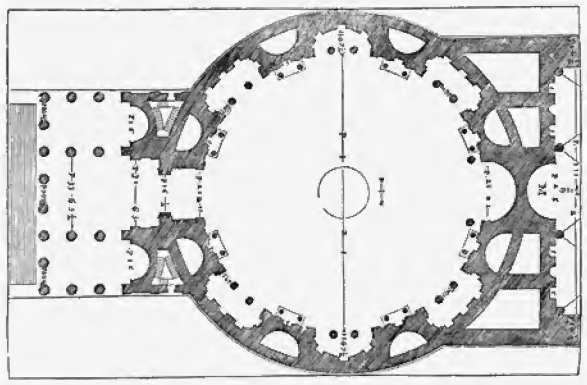
The **open floor plan** prefers the continuum of **spaces that flow into each other** over the sequence of adjacent rooms. The open space apartment with its different functional areas does away with hallways and spaces used for circulation alone. The Farnsworth House by Mies van der Rohe (1945–50) consists of a roof and a raised floor. The relationship between these two plates compresses space in between while the exterior space beneath the building seems to flow freely around the building. Eight exposed steel pillars hold up the ceiling. Within this spatially densified zone a glazed enclosure becomes the interior space. Mies places two solid elements into this enclosure; a core consisting of the kitchen and bathroom and an adjacent room for the utilities and chimney. Through its asymmetrical arrangement in the space this core defines other zones for living, dining, and sleeping, while the wardrobe unit separates the living and sleeping areas. The orientation of the main axis of the rectangular structures is emphasized through the parallel repetition of the terrace and cantilevering of the floor and ceiling planes.

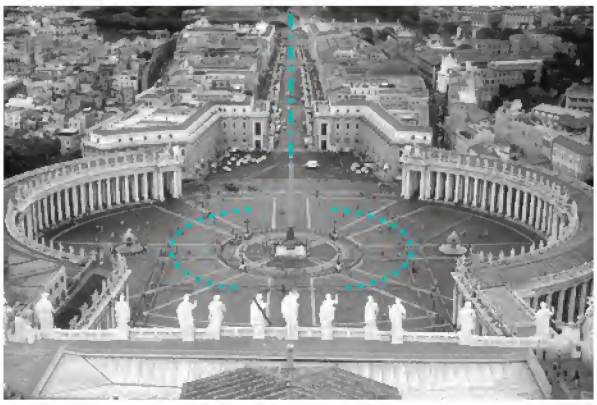
open floor plan

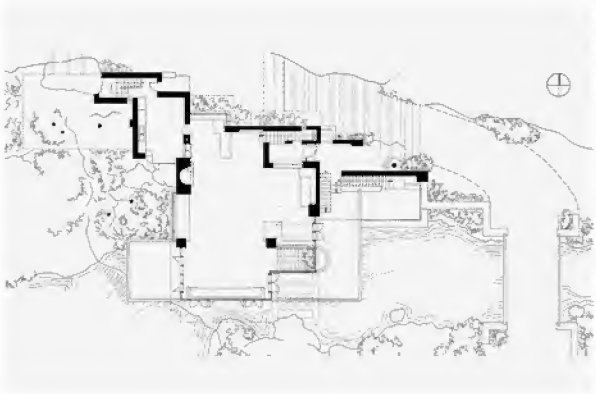
The architect Gerald Franz works with **isovists** in conjunction with a study conducted by the Max Planck Institute to develop "space syntax". This method attempts to analyze an open floor plan according to its "affective qualities" by representing visible spatial form from a given location as a polygon. In experiments on polymorphic or **polyvalent** spaces he found that the emotional reactions during research depended on the relation between visual complexity and recognizable order.

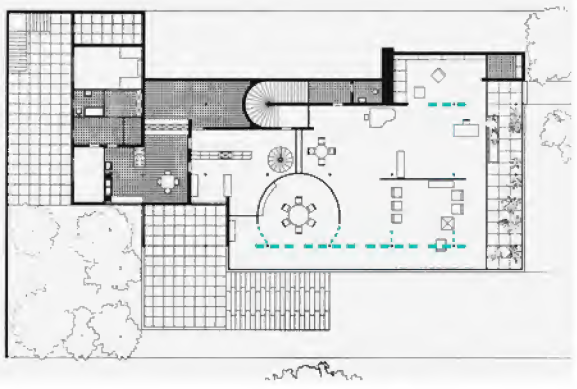
The Philharmonic Hall in Berlin by Hans Scharoun is designed as an open and yet centered space and ties together visual complexity and recognizable order. The ceiling and the suspended acoustic reflectors respond to the base plane while also acting independently. The tent-like convex ceiling increases the overall concentration toward the center of the space, and despite slightly varying orientations, the audience galleries face a central spatial field.

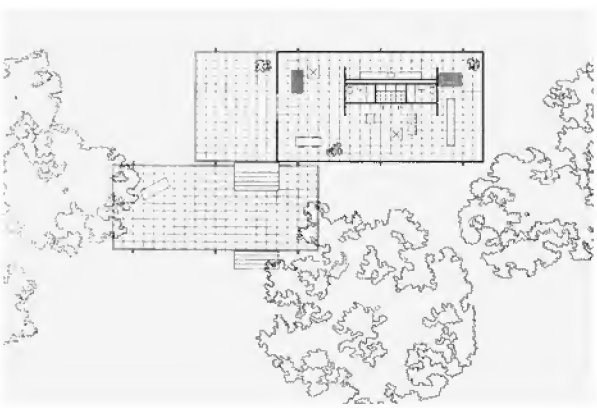
polymorphic

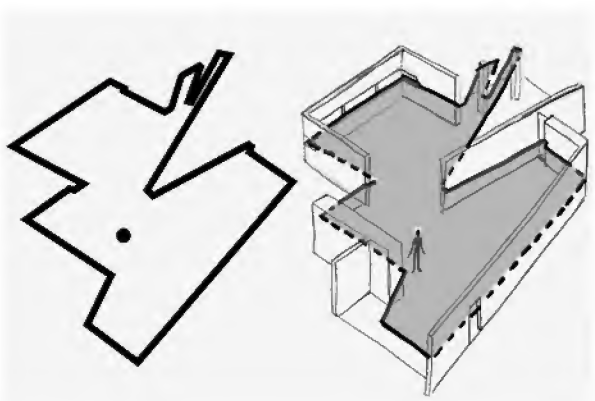












Space 3|2| Vertical Spatial Sequences

Space 3|2|1| Flow of Vertical Space

In the Raumplan Adolf Loos guides space to flow through several levels. The spatial sequences from the living room to the dining room to the studio are arranged around the staircase in a spiral progression from public to private space. The different levels and varying ceiling heights are not intended just to fit needs but also to have a psychological meaning. Thus Loos provides a raised sitting area in his studio for the woman of the house, which like an audience loge, provides intimacy but also a good overview. Its position above the entrance to the spaces for socializing and a view of the entrance and the exterior space, provides both privacy and a sense of control.
Loos was able to realize this concept most clearly in his Müller House in Prague, as shown in the section model.

Raumplan

Continuum of Space

Le Corbusier defines **architecture as volume and movement**. Material and implied spatial volumes enter the user's field of vision in temporal progression; various accentuations, pauses, and tempi determine how we experience the spatial continuum. In the Villa Savoye Le Corbusier addresses movement and guidance. He rejects an arrangement of individual rooms in sequence for a rhythmical spatial continuum. Stairs, ramps, interior and exterior complexes let the user experience a range of pathways in a spatial layout.

Rem Koolhaas / OMA seeks to awaken "potentialities" that arise out of the given program. Thus a semi-public path, the so-called "trajekt", twists its way through the Dutch embassy in Berlin. The trajekt spirals through the cubic form of the building, oscillating between "continuous and discontinuous", while offering views of the city and measured glimpses into embassy departments.

promenade

Le Corbusier developed the apartment complex Marseille Unité d'Habitation using his system of measure called the **Modulor**. He generated various ceiling heights depending on the functional tasks and spatial characteristics intended for each individual room. The living room volume extends two levels, while the entrance and sleeping areas have lower ceilings. The gallery on the top floor offers a view of the living room area and brings a new spatial experience. One inner corridor serves three levels of the building.

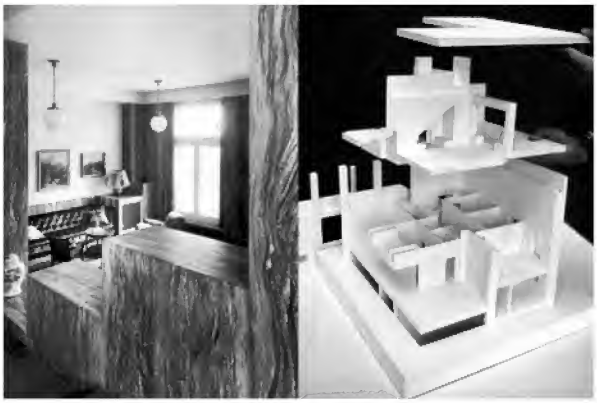
A section through Le Corbusier's February 1928 design for the Villa Baizeau in Carthago shows a stacking of levels, whereby there are always two levels of interlocking volumes, each occupying the same spatial zones. The connections between the levels is accentuated by the perpendicularly positioned stairways. Two story columns emphasize the double height spaces that exemplify his Dom-Ino system.

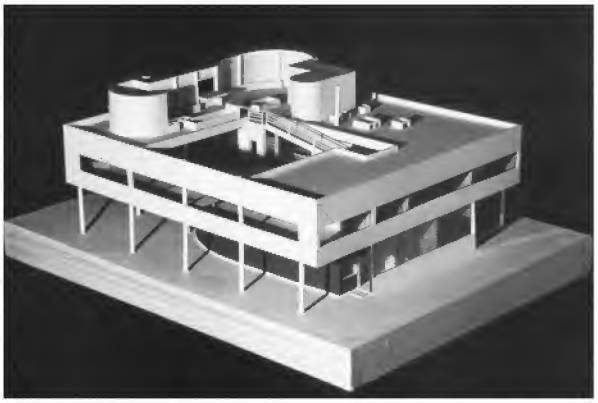
dual-level

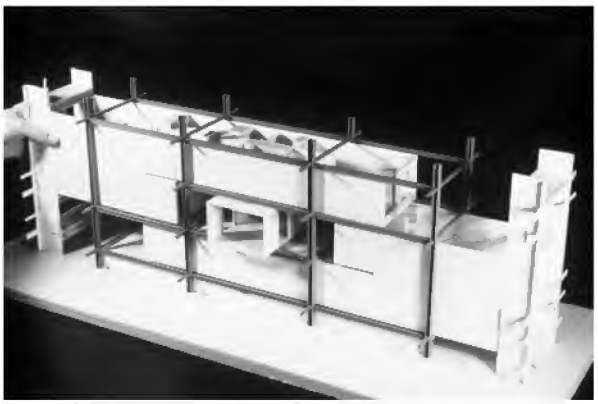
The Laban Dance Center in Deptford by Herzog & de Meuron is an urban artifact inserted into a former industrial area that is intended to have a culturally stimulating effect on its surroundings. It gets its simple form through its apparently soft skin, which consists of colorful translucent polycarbonate panel cladding. One can follow the activities in the studios from the curved and tapered circulation ramps. These pathways follow a different pattern on each level. A further studio space breaks downward through the ceiling.

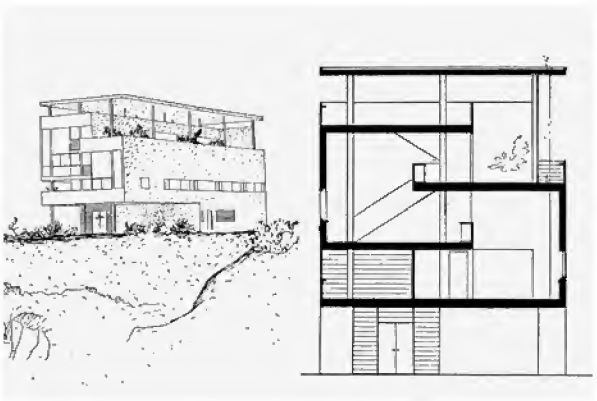
The entrance area and foyer of the cultural center in Matsumoto by Toyo Ito (2001–04) overlap with the gallery and the café area and form a continuous space that flows out to the street via the wide staircase. These **ambivalent** zones give a manifold and vibrant spatial impression. Different forms and materials are used to allude to correlations within the areas.

multilevel









Spatial Overlap

In their essay "transparencies" Colin Rowe and Bernhard Slutzky describe situations of spatial overlap in which areas of several rooms are used simultaneously. The various possibilities of allocation create ambivalent situations that can invest the individual spatial zones with several meanings.

Excerpt from Thinking Space: P House Case Study (Franziska Ullmann)

The design for this house is based on two themes: the swiveling of two blocks and the interpenetration of those two volumes. The transparency of spaces and the various possibilities of relating them allow a manifold interpretation of the spatial connections both horizontally and vertically. The act of traversing the blocks and relating them to each other creates, in the course of use, a mental ordering structure in which perceptions are inserted. The actual spaces in addition to the recalled spaces in various sequences make the small house seem larger than its 7m x 10m dimension and allow it to be used flexibly.

The house is entered above its middle on an entrance platform that gives an overview of the interior along the axis of the staircase. The entrance platform on the long axis of the cascading steps is the first space in the house that extends horizontally, thus providing both an arrival and resting point in the downward axis. The form of the void over the entrance area – which extends vertically into the roof space – forms the entrance area and is also the turning point for the stairs to the upper level. The pull of the high space over the turning point eases the ascent of the occupants into the private bedrooms.

One pauses on the entrance platform; this natural hesitation, following the pull of gravity, and the view down into the valley, guides the visitor to the second landing where the service rooms and a guest room are situated. The view, framed by the wall element is still concentrated along the line of the slope. From the west, light enters the cloakroom area and optically enlarges it despite the limited space of the landing beneath the upper level.

ambivalence

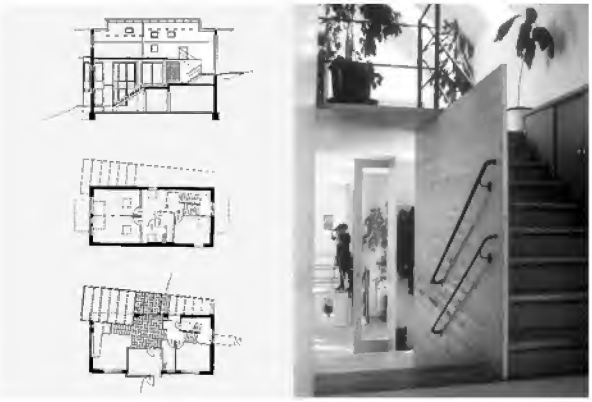
After a few steps further downward one reaches the center of the house. The third landing on the long axis is met by a great transverse force that extends outside the house, widening it into a hall and creating a place of exchange between inside and outside. The physical center of the house coincides with the center of activities; kitchen and dining space are significant elements on this main level. A bridge crossing the stairs forms the connection to the inserted wooden box of the veranda.

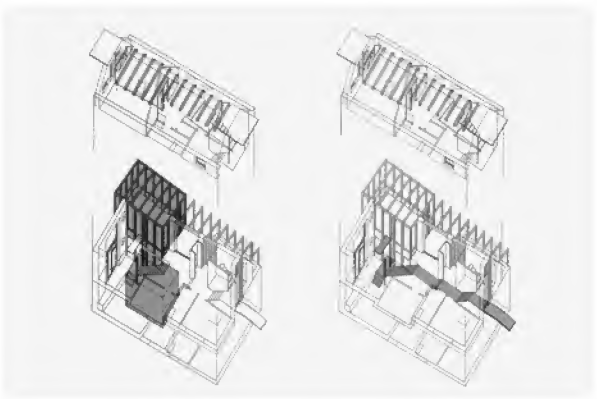
While the interior spaces on the main level form an enclosing ring around the stairs to the lower level, the main room steps back from the façade and forms a gallery overlooking the living space on the lower level. Continuous windows connect the two levels.

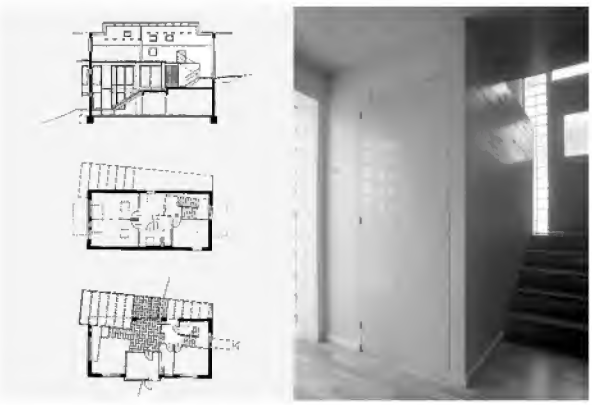
Finally, the staircase leads down to the living space. The entire volume of the main level rests above it, but via the gallery it spans two stories. From here the occupant sees the entrance platform and thus retains the impression of the entire pathway and its corresponding volumes.

Here at the lowest landing, the stairs stop and two directions are presented. To the left and down two more steps is the sunken living space and to the right is the fireplace room beneath the winter garden.

overlap







The addition of spaces can take place in a vertical arrangement – either stacked or interlocked. If we view individual spaces as containers, their addition is readily visible and recognizable from the building's exterior.

Agglomeration. Accumulation

An example of the simple stacking of spaces around a vertical open space to form a large structure is this office building in Mexico City nicknamed "trousers". It shows how we orientate ourselves using simple comparisons of form. In the Capsule Tower in Tokyo by Kisho Kurokawa one can visually distinguish the individual prefabricated spatial cells grouped around a vertical access pathway.

Günther Domenig places a new building volume over the entrance of the Documentation Centre of the Nazi Party Rally Grounds and distinguishes clearly between the extant building and the new extension that penetrates the existing building like a lance.

At the Nagaoka Lyric Hall complex by Toyo Ito the individual building volumes of the auditoriums pierce the ceiling of the common foyer. This measure ties them together as a whole. Inside the complex they are nonetheless distinguishable as independent objects, especially at night.

By contrast, in Günther Domenig's Stone House in Carinthia one recognizes separate volumes of differing formal and material composition. They are tied together within the interior, creating a continuous spatial flow through several levels.

Spatial Penetration

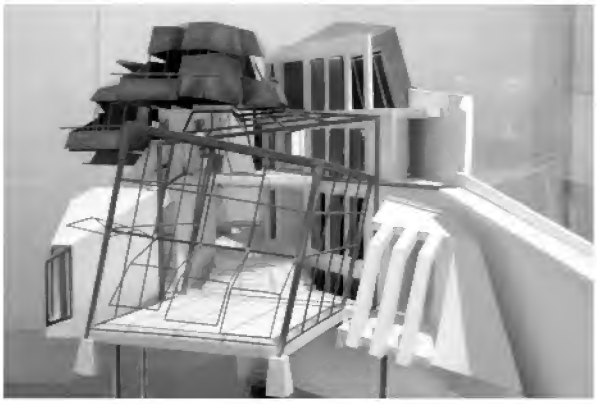
The Spanish architect Alfredo Payá created a complex spatial situation by designing two interpenetrating rectangular volumes for the Alicante University Museum. At first glance it looks like a large rectangular solid standing in a pool of water. Actually, it is a sunken rectangular volume that is partially open to the sky and partially covered by the pool of water. The second rectangular volume is inserted in the sunken space and is open at the bottom. The two volumes and their open spatial zones interpenetrate each other and make use of some of the same space.

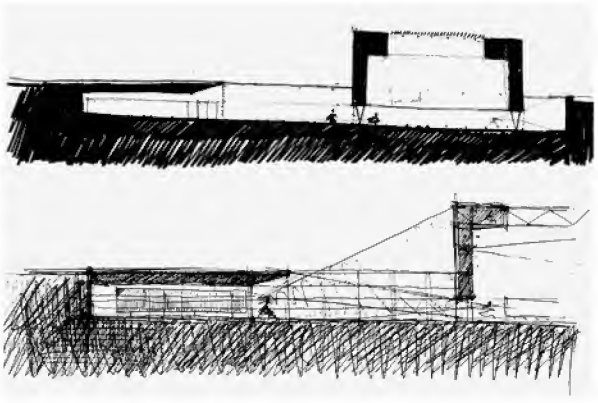
spatial volume

The inner cuboid propped up on V-shaped supports is accessed from the level of the sunken museum courtyard and is interlocked with the exterior space. The building is free standing and surrounded by circumfluent space, while the large exhibition space almost seems to hover over parts of the transverse sunken courtyard.

Skylights recessed into the ceiling illuminate the large exhibition space and relate to the light entering along the sides of the room along the floor.
This reinforces the penetration of the horizontal and vertical spatial volume. The full courtyard volume passes unhindered across the sunken courtyard – held only by the cuboid.

penetration





Space 3|2|2 Combination and Organization Based on Superordinate Principles

For centuries we did not, for the most part, differentiate between space-forming and space-bearing elements. Like in the earlier example of the painting by Mondrian, here the lines bordering the planes also become space-bounding walls that serve more than one space at a time. The floor plan of the Villa Rotonda by Palladio is based on simple geometrical figures aligned in **axial symmetry**. The middle is formed by a circular central space with a dome. The other spaces are arranged radially and in an apparently strict hierarchical order around this center point. The symmetrical axes overlap with the access and viewing directions, producing a crisscrossing dynamics strongly seeking to interact with the distant landscape. The dome above the rotunda holds and attempts to calm this yearning.

centering

The new addition to the Staatsgalerie Stuttgart by James Stirling plays with the classical principle of spatial sequences that Karl Friedrich Schinkel used in the Altes Museum across from the Lustgarten in Berlin. At the front of Schinkel's museum is a kind of stoa that houses frescoes and sculptures and serves to filter out exterior space. The rotunda, capped by a flattened dome like a pantheon, is where visitors gather before they enter the individual sections of the museum.

Stirling opened this rotunda to the exterior and thus kept the center of the facility free. In this way he created a large inner courtyard for the museum visitors. The front area and entrance zone are asymmetrically arranged and freely formed. A ramp and a stairway lead from two sides up to the upper-level museum entrance platform. The rotunda itself, a cylindrical inner courtyard, can only be accessed from the museum.

circulating

Another entrance door at street level leads to the upper side of town along a public ramp curving along the rotunda's edge. It offers a public pathway connecting the upper and lower parts of town. This is a reiteration of Stuttgart's traditional stairways that run along the slopes throughout the whole city.

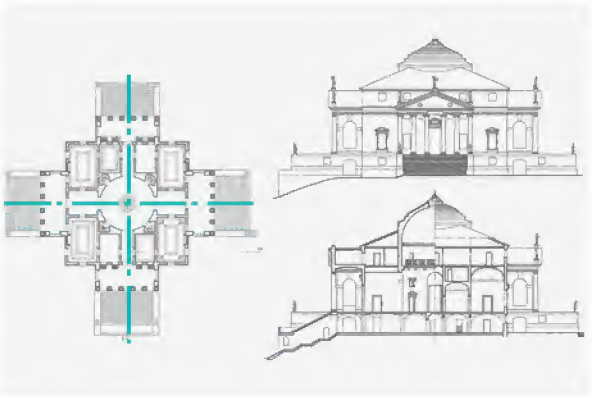
Unlike Schinkel's central hall and the symmetrical flights of stairs, here the entrance hall is a conglomeration of many spatial elements. Thus a small circular temple serves as an orientation point and information stand, whereas the curved exterior wall determines the free spatial form of the foyer. Traces of the different floor levels above can be detected in the ceiling. For example the external ramp is discernible as a slanted strip above the coat check area.

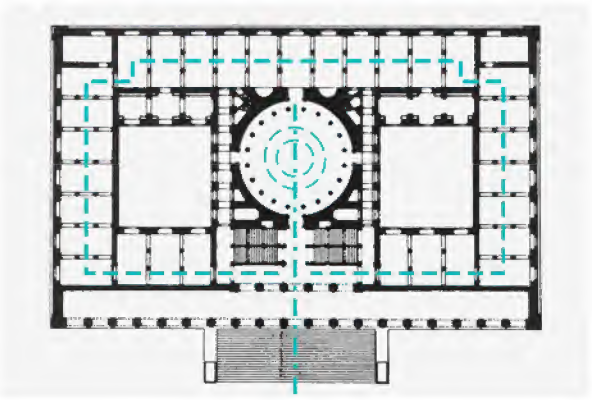
overlapping

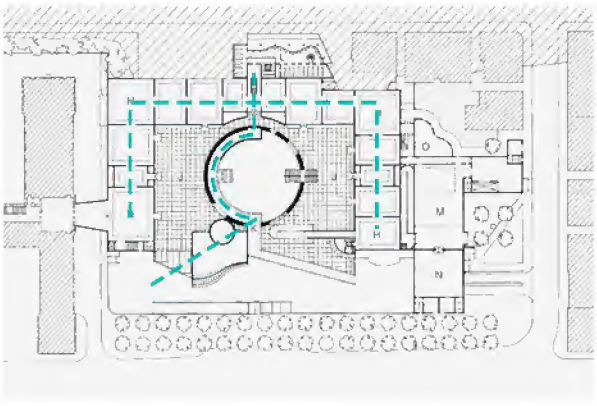
Space 3|3| Free Organization and Constellation of the Volumes

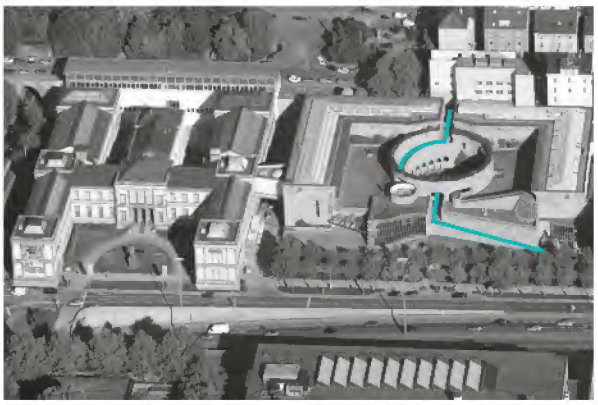
In the midst of an irregular city plan with branching streets the 21st Century Museum of Contemporary Art by Kazuyo Sejima and Ryue Nishizawa forms a new central place in the city of Kanazwa. The circular overall figure is non-directional and offers equal access from all sides. The exhibition spaces in plan view have a simple geometry like the circle and rectangle. The perimeter of the grounds, however, is defined by a circle that holds the composition of the apparently freely drifting spaces together as if on a tray. The walls of the exhibition volumes do not touch each other; the spatial containers are surrounded or separated by space as in an urban environment. Round and angular volumes initiate varying dynamics and directions around the volumes. Circulation also flows inside the circular perimeter, similar to that of the engawa of the traditional Japanese dwelling.

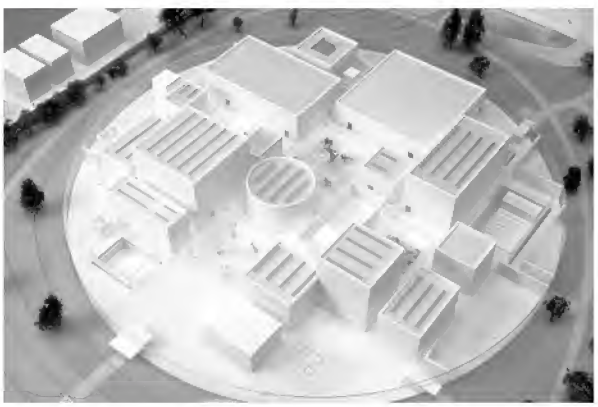
floating











Linear strands cover the high-speed railway terminal in Pusan, South Korea, as seen in the model by FOA. In the rooftop landscape a band-like structure emerges that ripples toward the high-rises that mark the end points. The group of high-rises marks the terminal and can be interpreted as a halting of the linear dynamics of the track.

Through the constellation and confrontation of individual buildings Thom Mayne – Morphosis manages to create a linear exterior space at the Diamond Ranch High School in Pomona, California. The variations in the positions of the buildings integrate different directions and allude to open spaces and niches. At the same time he creates an overall cohesion in the resulting formal freedom by making the volumes lean slightly inward and toward each other.

Urban spatial situations arise through the selection and arrangement of various building volumes. Their form and constellations determine the quality of these exterior spaces. Each volume is surrounded by its force or tension field. These variously directional energies are produced in relation to each other. Reinforcement, disruption, and even cancellation can occur depending on the forms of the objects and their constellations.

The volcano museum in the Auvergne region by Hans Hollein combines linear and vertical elements in a charged artificial landscape. Narrowing and widening spaces in horizontal pathways and in volcano-like cone-and-crater vertical sequences all produce exciting, dynamic spatial experiences.

path and place

The Atocha Railway Station in Madrid by Rafael Moneo with its combination of point-elements and linear and planar elements is a good example of how features and mediating dynamics can provide recognizability and orientation.
The clock tower as a point-element marks the change in direction between the new and old buildings.

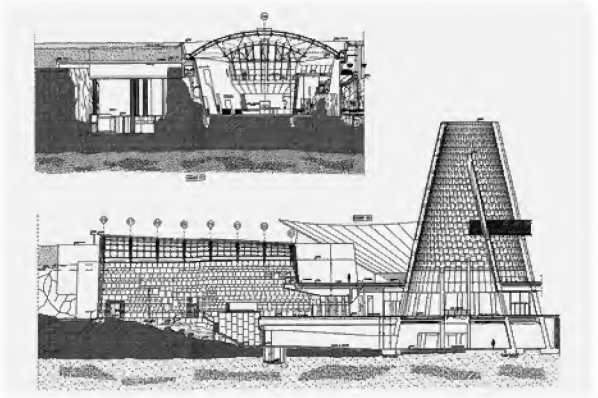
A centered planar element with a slightly arched dome suggests a gathering area at the junction point of different pathways and marks the descent to the train station level below.
Simultaneously the pillars support movement from the lower level to the street level.

collection

The cylindrical entrance object with vertical window openings emphasizes the connection to the level below, for which it also serves as a kind of over-dimensioned light dome and by virtue of its centered apex acts as an important orientation point. Escalators reinforce the physical connection. In addition, there are also staircases built into the cylindrical space.

The departure hall is conceived as a directional planar element. The ceiling is held up by a forest of round pillars whose inner structure ensures the unity of this enormous space and counteracts the linearity of the track form.

distribution



Space 3|4| Immaterial Elements

The dynamic effect of the architectonic elements discussed up until now is based on their geometric forms and figures. Besides material properties, we also perceive such stimuli as sounds and odors, and among these immaterial elements light is of particular importance in terms of perception and behavior. Natural light and the plasticity brought by shadows as time passes throughout the day – the three-dimensionality that shadows give to volumes – are a prerequisite for seeing space.

Light and Shadow

The sun provides light and warmth and references the center of our lives. Light and shadow let us determine the time of day. The rising sun in the **east** has always meant joy and is an anticipated event as manifested in many constructions and rituals. With the break of dawn shadows begin to form, and the higher the sun, the sharper the contrast between light and shadow becomes.

The setting of the sun in the **west** and the falling of night are associated with the transition from life to death (for the ancient Egyptians the Kingdom of the Dead lay in the west). In western tradition, however, the westwork of churches was reserved for the rulers, i.e. temporal power, in contrast to the transcendental eastern side.

In the northern hemisphere when the sun is at its apex, shadows fall to the **north**. The farther one is from the sun, the less the northern side is appreciated. While in the south people flock to the shade as protection from the heat and sun, in the north everything faces **south** where light and warmth come from.

These different qualities of the given natural lighting situation are essential elements in every architectonic design and influence the **orientation of space** and **spatial atmosphere**. *Architecture is the artistic, correct, and beautiful play of forms in light*, Le Corbusier wrote after his trip to Greece, where he had marveled at light and shadow and the effect and attention given them in architecture.

Light and Dark

Thus in addition to its evident significance light also plays an important **psychological role**. For human beings natural light means a visually comprehensible and controlled environment.

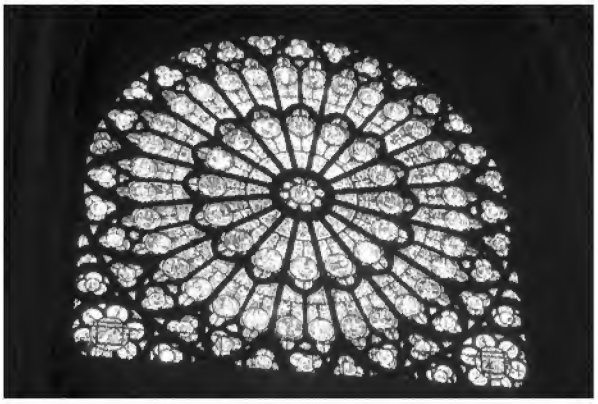
The orientation toward light is as critical to determining the dynamics of a space as are the basic geometrical shapes of the floor and ceiling. The position of the openings, the recognition of daylight, and the connection to the exterior, however, are important points of reference for orientation and spatial perception. **Direct lighting** and **lateral openings** in rooms provide direct contact with the life outside and are preferred.

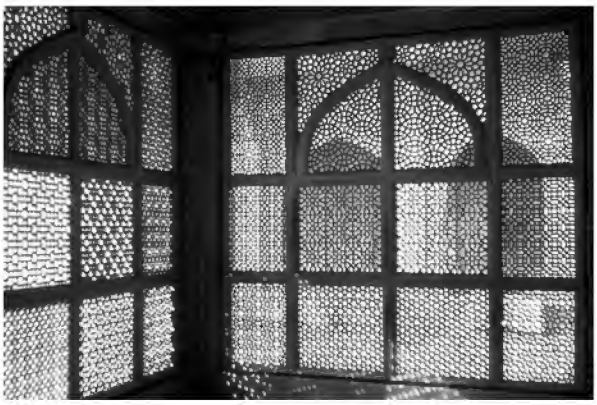
But the occupant also seeks protection from outside view. Perforated materials for effective visual screening provide a sense of security for the inhabitants.

Mood and Atmosphere

The effect of **zenithal light** may be three times stronger than lateral light and it is considered a special form of daylight. Spaces can be illuminated using **indirect lighting** where the light source itself is not visible. The quality of space and lighting creates an atmosphere that conjures up a specific mood. Graduations of light produce a muted atmosphere. The staging of indirect light can cancel out spatial boundaries and create a sacred mood. Bollnow speaks of mood-invested space and the resonance that this conjures up in people.

In his investigation of "lived time" the psychiatrist Eugène Minkowski emphasizes that we are not only capable of living time as a personally experienced duration – as Bergson argued – but also space. One shouldn't consider it a priori an inanimate aspect of life because space is not just "geometrical space" […], for lived space is also a "medium" of human life. [Gosztonyi, Der Raum, vol. 2 943, 946b]





Time and History

Light and shadow cast by the sun not only enable spatial vision and create different moods but they also show the passage of time during the course of a day.
By observing the sun and the position of the stars people recognized the cycles of the sun and moon in their daily, monthly, and annual rhythms and the effects of these on nature.
Buildings have been built for the observation of celestial bodies. Since observatories were oriented toward the highest point of the sun, they often stood out in the set grid of their surroundings and constituted special structures. Such buildings can be found in many cultures, e.g. the observatories and astronomical instruments near Jaipur and Delhi.

cyclic

History is the track left behind by the linear passage of time. There are no direct cycles of repetition; time passes and there is no turning back. For every organic being there is a beginning and an end, each moment is unique, only to become history a moment later. In this context the analogy of a river is often presented as a similarly non-recurring flow. Only the idea of transformation allows us to conceive of a water drop that after flowing down the river to the ocean evaporates and once again falls into the river as a raindrop. But, of course, it is not the same drop of water.
Materials change through use and wear; places bear the marks and traces of time.

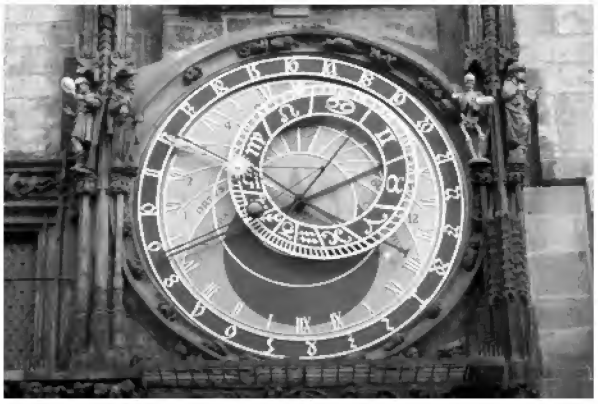
irreversible

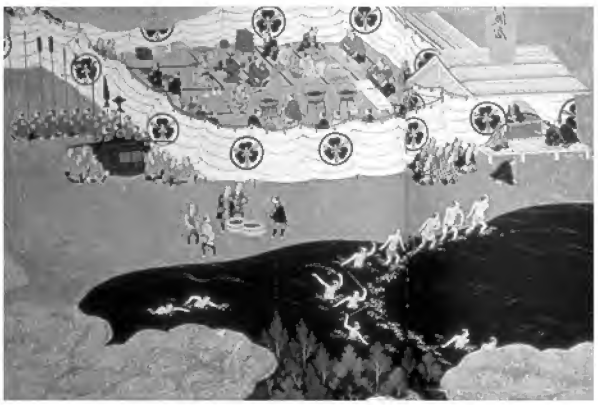
Ritual and Event

Extraordinary occurrences remain in human memory. Especially important events are passed down through stories and re-enacted in ritual events. For Mircea Eliade the origin of the ritual was the repetition of the act of creation. Depending on the content and importance of the ritual, spatial areas are assigned various imagined qualities, which are in turn inscribed and reinforced through repetition, like in the torch dance on the Domplatz in Salzburg. Rituals influence spatial mood and atmosphere; they are action that gives rise to place.
Even if a ritual is no longer re-enacted, the places may continue to be influenced by the character of the ritual, so that it can still be affective even if these subtle elements are intangible. Matter seems to possess its own memory, can absorb odors, for example, and perhaps this is what one senses, especially at “holy sites”.

Space as a Medium

In order to provide the space for human dynamics, open areas and spaces with no predetermined uses are especially important. Significant secular events and intermittent functions need temporary spaces that can be set up and dismantled, as in the case of these textile walls for a picnic to celebrate the Japanese cherry blossom festival.
For the self, lived space is a medium of bodily realization, complementary form or amplification, threat or preservation; it is a setting to pass through or to remain in, an alien land or home, a material space, a place of fulfillment and opportunity for unfolding, a resistance and boundary; it is a voice and antagonist of this self in its momentary reality of being and of life.
[K. Durckheim]
The built environment is the stage of everyday life and the setting for special occasions. It is dependent upon form and composition. Thus, architectonic elements ultimately constitute life’s background.





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Point

11 ON based on Klee, TTE, 125
13/ 1, 2 PB
13/ 5 from: Tomáš Valena, Beziehungen; Ernst & Sohn
15/ 3, 4, 5 from: Hollein, Places; model: Werner Schmidt, photo: Sina Baniahmad
15/ 6, 8 PB based on Arnheim, DAF, 61, 36
15/ 7 from: Saint-Exupéry, The Little Prince
17/ 1 BEK (Bose-Einstein-Kondensat) archive, 5. Physikalisches Institut, University of Stuttgart
19/ 1, 2, 3, 7 ON
19/ 6 Stefan Felbermayer
21/ 1, 5, 6b PB
21/ 7 from: Gronegger, Roma decorum; drawing: Thomas Gronegger
21/ 8 from: Rowe/Koetter, Collage City
23/ 1, 2a PB
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31/ 1, 3 ON based on cat. Plečnik; drawing: Tomáš Valena
31/ 2 ON
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33/ 1, 2, 5, 6 PB
33/ 3, 4 archive Jae Cha, Washington
33/ 7a+b archive Kazuyo Sejima
33/ 8a+b archive Reitermann & Sassenroth
35/ 1 PB
35/ 2b from: von Meiss, Vom Objekt…, 104
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37/ 1b ON
37/ 3, 5 PB
39/ 1 ON
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39/ 4 drawing: archive Franziska Ullmann
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41/ 1 ON
43/ 1a, 2 from: Rafael Moneo, Bauen für die Stadt, 34
43/ 1b, 3b ON
43/ 3a, 4, 5, 6 from: a+u 5/1976
45/ 3, 5, 7 PB
45/ 8 from: Tomáš Valena, Beziehungen; Ernst & Sohn
47/ 1, 2 PB based on Kandinsky, PLP, 49, 50, fig. 1, 2
47/ 3 from: catalogue Klein, 220; Le globe terrestre, 1960, photo: Harry Shunk
47/ 4, 6b, 8b PB
49/ 6 archive Bernard Tschumi
49/ 7, 8 from: von Meiss, Vom Objekt…, 67
50/ 1 Zen garden Kyoto
50/ 2 Jean Nouvel, steel cube, Battle of Morat, EXPO Suisse 2002
51/ 1 Jun Aoki, bird observatory near Niigata
51/ 2 Frank Lloyd Wright, Johnson Wax Building

Line

53/ ON based on Klee, TTE, 125
55/ 2 ON
55/ 3 Wolfgang R. Fürst – wrfuerst.com
55/ 5 from: Klee TTE, 196; Tightrope Walker (detail)
57/ 5 archive Mark Mack
59/ 1 from: Klee, TTE, 102; Rock
59/ 5, 7 ON
59/ 6 Xenakis, light installation, cat. Expo Paris 1937
59/ 8 ON based on Doxiadis, Raumordnung…
61/ 1 ON
61/ 2 ON based on constellation Ursa Major
61/ 3a ON based on Giedion, Raum, Zeit, Architektur, fig. 27
61/ 4 Stefan Felbermayer
63/ 1, 2 archive Schloss Schönbrunn Kultur- und Betriebsges.m.b.H.
63/ 3a, 4a MS
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63/ 4b diagram: Franziska Ullmann
63/ 5 ON map of Brasília, Guia de Arquitectura, 435
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65/ 1 ON
65/ 2 archive Ebner–Ullmann
65/ 3 ON based on plan of Miyashima
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67/ 5 AS
67/ 6 ON based on Kandinsky, PLP
69/ 1b ON based on Klee, TTE, 19
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69/ 8 from: Nobis, Lärm der Straße, fig. 189
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75/ 3 Athanasius Kircher, Turris Babel, Amsterdam 1679; drawing: C. Decker
75/ 4 SB
75/ 4 Wolfgang Neubauer and Archeo Prospections
75/ 7 based on Huber Kartographie, Munich
77/ 1 Lotte Sanwald
77/ 2 ON based on Frampton, Die Architektur der Moderne, fig. 148
77/ 5 from: Kandinsky, PLP; El Lissitzky, demonstration space
79/ 2 archive Shigeru Ban
79/ 7, 8 SB
85/ 1 ON based on Klee, TTE, 147
85/ 2 ON based on Arnheim, POC, 11
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89/ 5, 6 archive Francis Soler
89/ 7 from: baumeister 7/00
90/ 1 Wallersee, Salzburg
90/ 2 Santa Monica Pier, Los Angeles
91/ 1 Katsuhisa Kida/FOTOTECA, Echigo-Matsunoyama Museum of Natural Science, Tezuka Architects
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Plane

93 ON based on Klee, TTE, 125
95/ 1 drawing: Toyo Ito
95/ 5, 7 ON
95/ 6 AS
97/ 1, 3, 4, 5, 6 ON
99/ 1 ON based on Klee, TTE, 125
99/ 5, 6 ON
101/ 7 ON based on Klee, The Nature of Nature, TTE, 193, and Arnheim, MDM, 9 (POC)
103/ 1 PB
103/ 5 ON
105/ 2 Weilburg Baden, etching; courtesy of Dara Birnbaum
105/ 3, 4, 5, 6a, 7, 8 ON
107/ 1 Elmar Bertsch
107/ 2 photo of the model, Modellbaustudio Martin Hechinger, photo: Joachim Heyer, Boris Miklausch
107/ 4 archive Max Peintner
107/ 5 archive Ebner–Ullmann

107/ 6 PB
109/ 1 based on Kiefer, cat. cover
111/ 1 ON
111/ 5 ON based on Eugène Grasset
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113/ 2 from: Kostof, Das Gesicht der Stadt, plate 3; Palmanova
113/ 3 Gabriel Orozco's house, Mexico
113/ 5 ON based on Stierlin, Architecture of the World
113/ 6 PB
113/ 7a archive Gesa Lambertz
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115/ 1, 3, 6 ON
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123/ 3, 4 from: Warncke, De Stijl; Piet Mondrian, details from "Composition No. 3 With Color Planes" and "Composition", 64
125/ 5b from: Asterix and Obelix, vol. 31
129/ 1 from: Le Corbusier, Mein Werk, 43
129/ 2 archive Werner Sobek Ingenieure Stuttgart
129/ 3 ON based on Johannes Spalt
129/ 4 archive Johannes Spalt
129/ 5, 6 archive Atelier BKK3
130/ 1 Ryoanji Garden, Kyoto
130/ 2 Plaza Mayor, Mexico City
131/ 1 landscape near Niigata
131/ 2 village square in Tunisia

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133 ON based on Klee, TTE, 125
135/ 3a, 3b, 4a ON based on Klee, TTE, 142 and 171
135/ 4b based on Dia, Schlemmer, Frauentreppe, 1925, Kunstmuseum Basel, inv. no. 1753
137/ 1a+b from: Hollein, Places; model and plan: Leitner-Gundolf, photo: Sina Baniahmad
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141/ 1 drawing: Hans Hollein
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141/ 3 ON based on Stierlin, Architecture of the World; Treasury of Atreus
141/ 6a from: Frampton, GDA; The Primitive Hut, Frontispiece of the 2nd edition of Laugier's essay sur l'Architecture, engraving by Ch. Eisen, 1755
143/ 1 ON
143/ 4a Shuhei Endo
145/ 3 PB, ON
145/ 6 Lotte Sanwald
147/ 1, 8 ON
147/ 6 PE
147/ 7 archive Shigeru Ban
149/ 1 ON based on Klee, TTE, 105
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149/ 4 archive MVRDV, Villa KBWW
149/ 5 from: werk, bauen + wohnen 11/2002, 19; Claude Parent, "Inclipan", detail of a habitable volume/unit, 1974
149/ 6 PE
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151/ 2 from: El Croquis, 72/1995, 87; model: Van Berkel & Bos, photo: Hisao Suzuki
153/ 4 from: Blaser, Chinese Pavilion Architecture; fishermen's baskets, Southern China
153/ 8 from: Bogner, Kiesler. Inside the Endless House
159/ 3 PB
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161/ 1, 7 ON
163/ 1 ON
163/ 2 from: Rowe/Koetter, Collage City, 29; cenotaph, 1784, section Armillar-Version
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177/ 5 archive Ryue Nishizawa
177/ 7 archive Hans Hollein
179/ 1 ON based on Grütter, Ästhetik der Architektur, fig. 192
179/ 3 from: Joedicke, RFA, 31
181/ 1, 5 ON
181/ 3 archive Günter Zamp Kelp
181/ 4 ON based on Achleitner III/1, 54
181/ 5 ON
181/ 7, 8 MS
183/ 3 from: von Meiss, Vom Objekt… , 123
183/ 4, 5 from: Hilbereimer, Mies van der Rohe, 65, 80
183/ 7 archive Gerald Fritz; polyvalent spaces
185/ 1, 2a+b archive IRG, University of Stuttgart
185/ 3 Villa Savoye, Paris-Poissy 1929, chair of the department of design, spatial design, and sacred architecture, TU München, Prof. Fritz Kurrent, model: Irene Rammensee, Rolf Richard Rammensee
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185/ 6 from: Le Corbusier, Mein Werk, 81
187/ 1a, 2, 3a, 5a, 7a archive Ebner–Ullmann
187/ 1b, 3b, 4a+b, 5b, 6, 7b, 8 SB
189/ 5, 6, 7, 8 archive Alfredo Paya
191/ 3, 4, 5 from: Rodiek, Stirling, 17, 15
191/ 6 PB
191/ 7 courtesy of 21st Century Museum of Contemporary Arts, Kanazawa, CD-ROM
193/ 2 PE
193/ 3, 4a+b archive Hans Hollein
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197/ 6 Wolfgang R. Fürst – wrfuerst.com
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197/ 8 PE; Jakob + McFarlane, Restaurant George
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198/ 2 boat landing, Maldive Islands
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199/ 2 fan dance, Shanghai; photo: Akelei Sell

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